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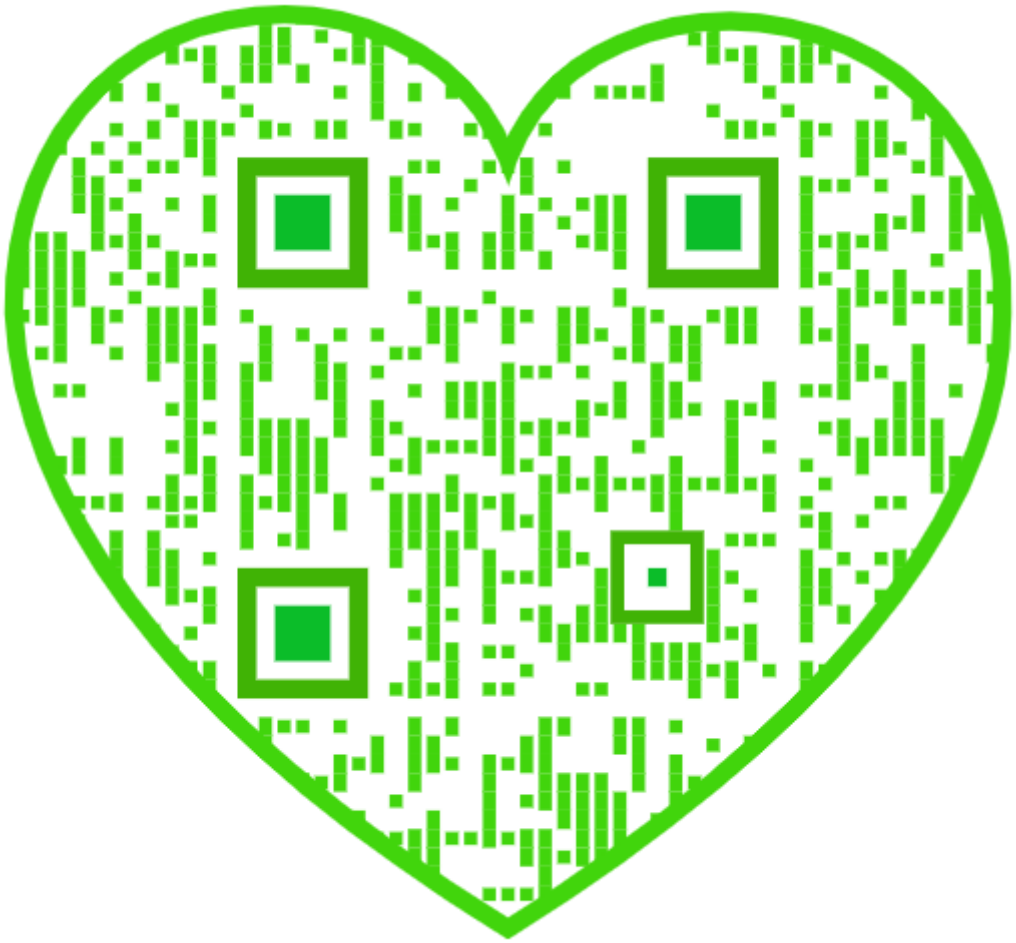

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NEW YORK, SATURDAY, OCTOBER 9, 1880.

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AMERICAN NAVAL DEFENSES.

In a recent number of the SCIENTIFIC AMERICAN it was shown that the City of New York could easily be reached by the shells of a hostile fleet either from the outer bay or from the open sea. This possibility in case of war can be met only by constructing ships for an efficient navy. It is not New York alone that is in danger, for nearly every important city on our coasts runs an equal or greater risk, and, although it might be possible to protect one city by concentrating there all our available force, it is too much to expect that any general security can be obtained until our navy receives a large addition to its strength.

Take Boston, for example. There are supposed to be ample fortifications to protect it, yet it is even more defenseless than New York. Lying at a distance of less than seven miles from the State House, a war ship would be entirely outside of the effective range of any gun mounted to defend Boston to-day. And even the heaviest guns that might be mounted on shore in the future could not give adequate protection to the city. A hostile fleet of ironclads could quietly anchor in five fathoms of water between Deer Island and Nahant and still be within six miles of the wharves and warehouses of Boston, while the nearest fortification now in existence would be two miles away—too far for even the heaviest guns to penetrate armor of twelve inches. There are guns already existing known to throw more than seven miles, and others are estimated (although not proven) to have a range of twelve miles; therefore, with such guns, ironclads could take up any position within this last-named distance and destroy Boston without being exposed to the least danger from shore batteries. Even though heavy guns be mounted on Long Island, Deer Island, and Nahant, the enemy could still occupy a position less than eight miles from Boston and be two miles distant from the nearest battery on shore. Portland is worse off than Boston, and Portsmouth is now equally helpless, although the Isle of Shoals might furnish sufficient protection if it was heavily fortified.

Turning to the Pacific coast, San Francisco might at first sight appear safe, being sheltered by hills varying in height from 300 to 1,000 feet. But, in reality, these elevations would be no protection whatever. The distance from the wharves in the inner bay to deep water on the other side of the peninsula is about six miles. A Krupp gun of 30 centimeters caliber, with an initial velocity of 1,500 feet, and an elevation of about 20 degrees, will give a range of six miles. The highest point of the trajectory with this elevation would be 2,965 feet, or a height far more than sufficient to clear the summit of Lone Mountain, which is about 1,000 feet high. At a distance of eight miles the vessels of the enemy would be out of danger from any guns on shore, and would have the whole city of San Francisco at their mercy.

But it is said by many persons that, in these days of civilized warfare, no nation would wantonly bombard a city of non-combatants which they never could expect to take. Inasmuch as such bombardments have frequently taken place in the past, it is perhaps too soon to assume that they will not occur again; but, admitting that a city like Portland might, on the score of humanity, escape such a visitation, there is no reason to expect the same immunity for New York, Boston, or Portsmouth. There are large navy yards in close proximity to these cities—navy yards which it would be not only the right but the duty of a hostile admiral to destroy in any way within his power. Now, at the distance from which the bombardment of the Brooklyn, Charlestown, and Kittery navy yards would take place, there can be no question that shells would fall promiscuously all about the neighboring cities.

But, even supposing that such accurate firing should be possible as to confine all the damage done within the limits of the navy yards themselves, can we afford, at the opening of a great war, to have our three principal navy yards destroyed? And yet, unless before such a war comes on, they are utilized to build war ships to meet the enemy at sea, they might just as well perhaps be destroyed. Public opinion would then be so effectually aroused that there would be some hope thereafter of having a naval force somewhat more in harmony with our importance as a nation. The inland States have such a preponderance of political power that all matters relating to naval and maritime affairs have failed to obtain, of late years, the attention that they deserve. Not only are people living in the interior indifferent to these subjects, but Eastern men in public life have also strangely ignored them; yet a powerful navy and an extended merchant marine are matters of as vital an interest to the farmers of the Western prairies as they are to the Eastern merchants. Give us a really formidable navy, and no nation in the world will willingly be drawn into a quarrel with us; leave our coasts unguarded, our commerce unprotected, and there is no third-rate foreign power that cannot in one year inflict upon us more damage than we, in five years, could retaliate.

A navy cannot be produced in a few weeks—especially if our navy yards are laid in ashes—and it is really astonishing that the business men of this country do not act more resolutely to induce Congress to give us a navy worthy of the name. The experiments of foreign governments have been sufficient to demonstrate in general terms the kind of vessels needed, and these should be built at once. The inventive talent of the country should also be encouraged by an annual appropriation for testing such valuable improvements on existing models as would maintain our prestige on the sea.

COMPRESSING AIR BY FALLING WATER.

Mr. J. P. Frizell, C.E., has recently given in the *Franklin Journal* a paper relating the results of some experiments made by him at St. Paul, Minn., upon the means of compressing air known as the *trompe*. The air is carried vertically downward in minute particles by a current of water which changes its direction to the horizontal, allowing the air then to rise to the top of the chamber through which the horizontal flow passes. At the falls of St. Anthony, in the Mississippi River, a shaft sunk some years ago was used for the experiments. This shaft was 36 feet deep, with clear dimensions of 6x14 feet inside. The apparatus consisted of a strong tank at the bottom of the shaft and two vertical channels rising to the surface. The one for the downward current of water had a section of 15x30 inches, the other, 24x48 inches. To supply the minute particles of air to the descending current, a siphon with small air holes was first used, but afterward the water was *aerated* (so to speak) by giving it a slight fall at its entrance.

In the tank the current was directed along the lower portion by a partition of plank placed 21 inches below the top. This partition was full of holes to enable the air to rise freely, and the space above it was called the air chamber. There was a hole at the level of the partition to enable the air to escape into the ascending shaft as soon as the air chamber was full, and made known this fact to the observers by the large masses of air rising to the surface. The capacity of the air chamber was 71·19 cubic feet. The difference of level in the surface of the water above and below the apparatus was 4·07 feet. But this head was greatly reduced for effective work as follows: Lost in fall to produce air bubbles, 1·000 foot; in resistance to movement, 0·443 foot; in slip, 0·653 foot; total, 2·096 feet; leaving only 1·974 feet available. But the effective power obtained by the experiments never exceeded 52 per cent of what it would have been if the water had been used directly to turn a wheel, nor do the experiments serve any practical purpose in showing the possibility of utilizing this means of obtaining power. Taking the formulæ as given by Mr. Frizell and applying them to a fall of 15 feet, only 76 per cent of efficiency is obtained, and with a fall of 30 feet only 81 per cent. Mr. Frizell's experiments are chiefly interesting as showing that this method of employing a waterfall is *not* economical nor practicable.

EMPLOYERS' LIABILITIES.

The tendency of legislation to throw safeguards around human life, and to hold railway corporations and others employing men in more or less dangerous occupations to the duty of making use of all available means to lessen the hazards of travel and labor, is well shown in the recent bill before the British Parliament, known as the Employers' Liability Bill. The object of this particular bill is "to extend and regulate the liability of employers to make compensation for injuries suffered by workmen in their service." It provides that in cases of injury resulting in death, the employer shall be liable, and the representatives of the injured party shall have the same right of compensation as if he had not been in the service of the employer. The limit of sum recoverable was first set at three years' earnings of a person in the same grade of employment in the district in which the injury was received; but in the House of Lords it was, on the motion of Lord Beaconsfield, reduced to two years.

By the terms of the bill the employer is liable for personal injury to a workman in cases where the injury is caused: (1) by reason of any defect in the ways, works, machinery, plant, or stock-in-trade connected with or used in the business of the employer; or (2) by reason of the negligence of any person in the service of the employer who has superintendence intrusted to him while in the exercise of such superintendence; or (3) by reason of the negligence of any person in the service of the employer to whose orders or directions the workman at the time of the injury was bound to conform, and did conform, where such injury resulted from his having so conformed; or (4) by reason of the act or omission of any person in the service of the employer done or made in obedience to the rules or by-laws of the employer, or in obedience to particular instructions given by any person delegated with the authority of the employer in that behalf; (5) by reason of the negligence of any person in the service of the employer who has the charge or control of any signal, points, locomotive engine, or train upon a railway."

New Discoveries on the New England Coast.

The United States Fish Commission's steamer Fish Hawk has made two dredging trips the past summer along the New England coast. The dredging was done chiefly between 150 fathoms and 325 fathoms, and the yield was immense. More additions were made to the marine fauna of New England than in the previous six years. The discoveries during the two trips were 30 crustaceans and 70 mollusks, more than half of them entirely new; also 33 species of fish, of which 12 are entirely new to science, representing four or more new genera; and 27 were strangers to the fauna of New England.

FOUR MILLION TWO HUNDRED THOUSAND tons of hot water, averaging 135° F., are annually pumped from the Comstock mines. To heat this mass of water by artificial means would require a consumption of over 50,000 tons of coal a year. The water from some of the deepest shafts, 3,000 feet, has a temperature of 157° F.

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THE HUDSON RIVER TUNNEL.

In our paper for September 18 we gave an engraving showing in section the construction of the new diving bell, or caisson, employed by the Tunnel Company to recover the bodies of the lost workmen and repair the damages occasioned by the crushing in of the tunnel entrance. In connection with the same figure, we now present another engraving, Fig. 1, showing the caisson in position and fairly at work, it having been successfully sunk nearly to the depth of the tunnel arches.

The accident, by which the entrance portion of the tunnel at Fifteenth street, Jersey City, caved in, took place on the 21st of July last. Twenty men who were at work in the structure lost their lives. The company attempted to recover the bodies by sinking a coffer dam, but the expedient failed, and resort was had to a diving bell or caisson, which machine is here illustrated. It consists of a great box of timber and iron, closed and made air tight, except at the bottom, which is open. Rising from the center of the box is an iron air flue, through which the men and materials are passed, and compressed air is introduced. The interior working chamber is of cylindrical form in its ceiling, is 41½ feet long, 25 feet wide, and 18 feet high. The roof of the chamber is composed of strong timbers, heavily braced and filled in solidly with cement, which is carried up to a level, forming a deck on which the necessary sinking load is placed. The ends and sides of the caisson are built of planking, held in place by strong timber cross braces and iron tie rods, running from end to end and from side to side, through the air chamber, as shown in our engravings. This is believed to be the largest air chamber or caisson of the kind ever produced. The men work in an atmosphere of compressed air, which, at the date of writing, was 11 lb. per square inch, but which pressure will be increased the deeper the caisson sinks.

The method of sinking is as follows: The men dig away, little by little, the earth at the outer edges, or shoes, of the caisson; at the same time weights are piled upon the flat upper deck on the exterior of the machine to overcome the interior air pressure and cause the machine to descend. In this case railroad iron is used as the weights. The pressure of air within the caisson prevents the rise of water through the ground where the men are at work, so that the floor of the working chamber is comparatively dry. The compressed air to a certain extent escapes at the edges of the chamber and bubbles up through the earth and superincumbent water. The earth that is excavated by the workmen is thrown into a box and mixed with water, and when made into the proper consistency, it is carried up out of the air chamber to the surface of the ground by means of a pipe, through which it is driven by the force of the compressed atmosphere that exists within the chamber. The caisson is kept in vertical position by means of suspension rods, that extend from the outer edges of the caisson to strong timbers at the surface of the ground, the upper extremities of the rods being provided with screw nuts, which are turned to permit the descent or adjustment of the caisson. The upper end of the central air tube is provided with a lateral extension, shown in Fig. 1, called the air lock, where the men go in and out. The air lock has strong doors at each end; one door is opened and the other closed, when the men go in or out, and thus the escape of air is prevented.

In Fig. 1, the place where most of the unfortunate workmen were buried, is indicated by the crushed iron plates that formed the original roof of the tunnel entrance. In both figures the two tunnels shown represent the mouths of the portions of the twin tunnels already built, which tunnels will form the main lines of the railway under the Hudson River. When the caisson is fully sunk home it will occupy the position shown by the dotted lines. A single broad arched tunnel will then be built within the caisson, as indicated in Fig 2, to inclose the mouths of the twin tunnels; and the single tunnel will extend thence on a proper grade to the surface of the ground in Jersey City.

At the time of this writing the working success of the new caisson had been apparently demonstrated, contrary to the predictions of outside engineers, who prophesied that it was too weak in construction and must inevitably collapse when subjected to the pressures involved in its descent. No sign of weakness has, however, appeared, and the machine has gone down nearly to its final resting place. Some of the bodies of the lost workmen have been recovered. The first to be taken out was that of the brave Peter Woodland, the assistant-engineer.

BENZINE is said to be more effective than anything else for exterminating moths, roaches, etc.

THE LANDING OF THE OBELISK.

The transfer of the obelisk from Clifton, Staten Island, to the staging prepared for its reception at the foot of West Ninety-sixth street, has been delayed owing to the prevalence of strong northerly winds.

The method adopted for removing the monolith from the hull of the Dessoug was substantially the same as the one employed in loading it. The Dessoug, carrying the obelisk, was drawn out of the water in the cradle of Lawler's marine railway at Clifton. Then her bow was opened and the obelisk was run out upon a staging resting on two rows of piles driven for the purpose.

The reloading of the obelisk upon the pontoons to be used in floating it across the harbor will be accomplished as follows: The water will be pumped out of the pontoons which have been floated under the obelisk and sunk. In rising the pontoons will lift the stone from its temporary resting place, and a couple of tugs will tow the much-traveled monolith one stage further toward its final destination.

From the landing the obelisk will be hauled to the Park on a sort of portable tramway by means of a movable steam engine. The stone will roll upon cannon balls placed in the grooved tracks of the tramway.

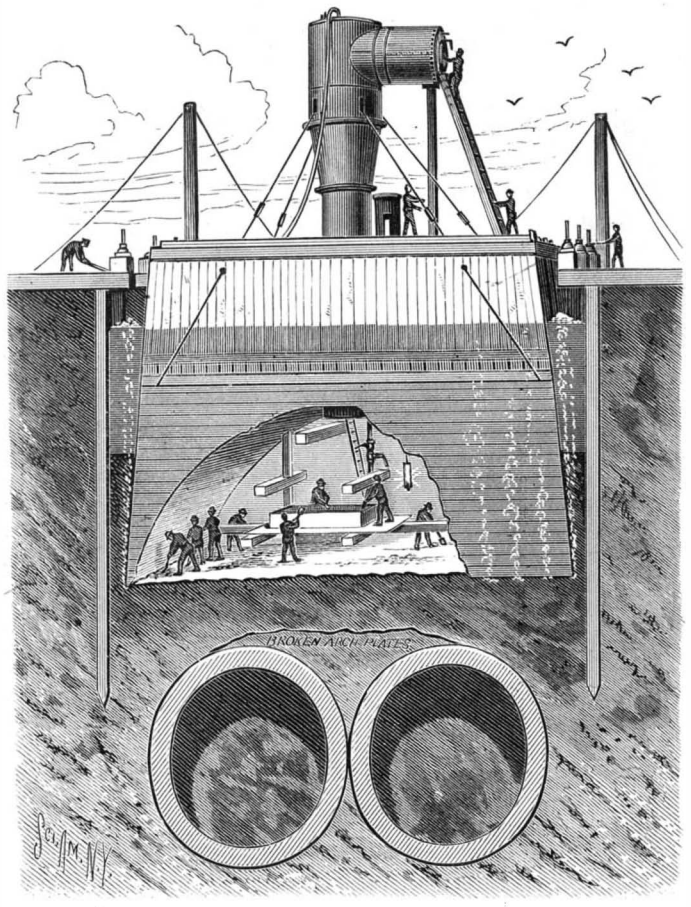

Fig. 1.—THE NEW CAISSON.—HUDSON RIVER TUNNEL.

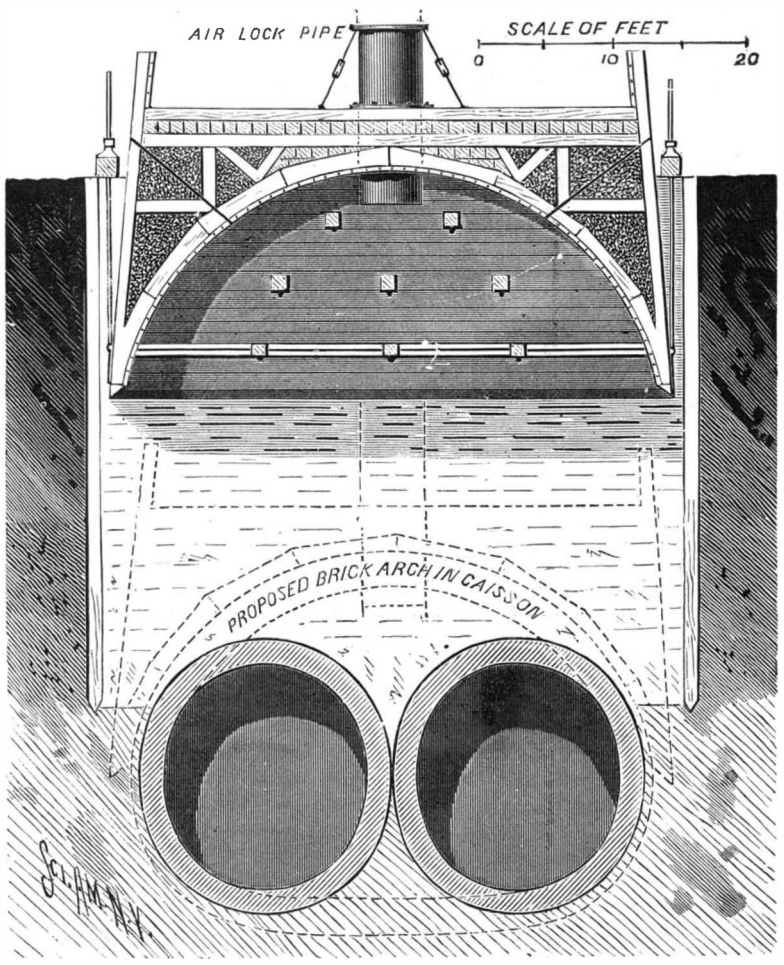

Fig. 2.—THE NEW CAISSON.—HUDSON RIVER TUNNEL.

The International Roadmasters' Association.

The second annual convention of the International Roadmasters' Association met in Chicago, September 8. The subjects of reports and discussions embraced track frogs and switches, the comparative action of frost on different material composing roadbeds, heaving, and the utility of tile and deep ditching; ballast and its preparation; track-laying; best forms of spikes, joints, nut-locks, rails, rolling stock, etc.; elevation of curves; and the relative merits of different kinds of ties.

The committee on track frogs found that the frog that gave the best results was the steel-rail spring frog always open for main track, for the reason that it was the safest for trains running at a high rate of speed, it gives no jar to rolling stock, is the least injurious to wheels and springs, its durability is greater than any open or rigid frog, costs less to keep in repair, and costs no more than any other steel-rail frog per foot. The committee also found that the steel-rail rigid frog, with wrought or rolled iron filling between point and wing rails, gave the best results in large yards where switch engines were constantly working.

The discussion of roadbed materials resulted in the decision that with proper drainage a good roadbed may be made of gravel, locomotive cinders, slag, or broken stone, either material to be used according to the cost at which it could be obtained in the particular section where it might be required.

The committee on railway curves and their elevation recommended the following:

1. That the limit of elevation of all curves should be five inches.

2. Changes of elevation on all old roads should be made by raising the outer or lower rail, as the case may require.

3. That the proportion of elevation at the tangent point to maximum elevation should be one-half.

4. That the rate of elevation on all curves, with speed at thirty-five miles per hour, should be three-quarters of an inch to a degree.

5. That in approaching a curve the rate in change of grade to get the necessary elevation of tangent point should be 1 inch to 100 feet.

The third recommendation was, after discussion, amended to make the proportion of elevation three fourths. The committee on switches, after expressing their personal favor for the Wharton and split switches as the most safe and economical, resolved to recommend no particular form of switch. The best switch would be one that came the nearest to an unbroken or continuous rail on main line and sidings.

A number of prominent roadmasters discussed at some length the proper size and weight of rails, but no decision was arrived at. The association will meet next year in Cincinnati, the second Wednesday in September.

Industrial America Abroad.

The *Tribune* recently announced the shipment of brush and broom making machines to the Holy Land by a Schenectady firm. They were for the American colonists at the foot of Mount Carmel. A short time ago the cable announced that an American mowing machine had taken first prize in a trial on the fields of Bulgaria. Simultaneously from Australia came the announcement that an American watch had been awarded the highest premium at the fair in Melbourne. Europe and the East does its weighing on American-made scales. A correspondent in Paris gave lately an account of the introduction of American elevators in hotels there. American hotel palace cars have been introduced in England in spite of English prejudice, and will soon overcome the opposition to their introduction in France which the parsimony of French corporations maintains. Our breadstuffs are sold in every market of the hemisphere; and special fleets of steamers convey live American beef to English markets. Every variety of canned goods finds favor there.

These are only a few of the facts which might be named in illustration of the recent material development of America abroad. The growth of our industries has not been confined to home; marvelous as it has been in the last decade or two, it has been equally surprising in the older countries. A few years ago American pork and cotton were about the only staple productions which Europe largely bought of us; now there is a large trade in nearly every article of food grown or machinery invented in America.

The Largest Lathe.

The St. Chamond Steel Works, France, boasts of having the largest lathe in the world. It was manufactured by Sir Joseph Whitworth & Co., of Manchester, England, and has just been set up in France for turning 100-ton guns.

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RAILWAY IMPROVEMENTS.

The annexed engravings represent improvements in grain car doors, and in railway draw bars, recently patented by Mr. Thomas Hibbert, of Cochran, Ind. The car door is designed for application to ordinary box cars to adapt them to the transportation of grain. It is arranged so that it closes the lower half of the doorway when the car is to be used for grain, and swings up out of the way when the car is used for goods. The door, A, fills the lower half of the door opening, and is cut away at the free end and fitted to the flanged guard or stop, D. The opposite end of the door is pivoted to a bar, B, which, in turn, is pivoted to a post secured to the side of the car. The bar, D, carries a projecting pin which engages a curved guide, C, fastened to the vertical post and to the floor of the car. This guide keeps the door in its place and prevents it from being lifted out of its place, when closed and locked; it also protects the door against injury when the car is packed with goods.

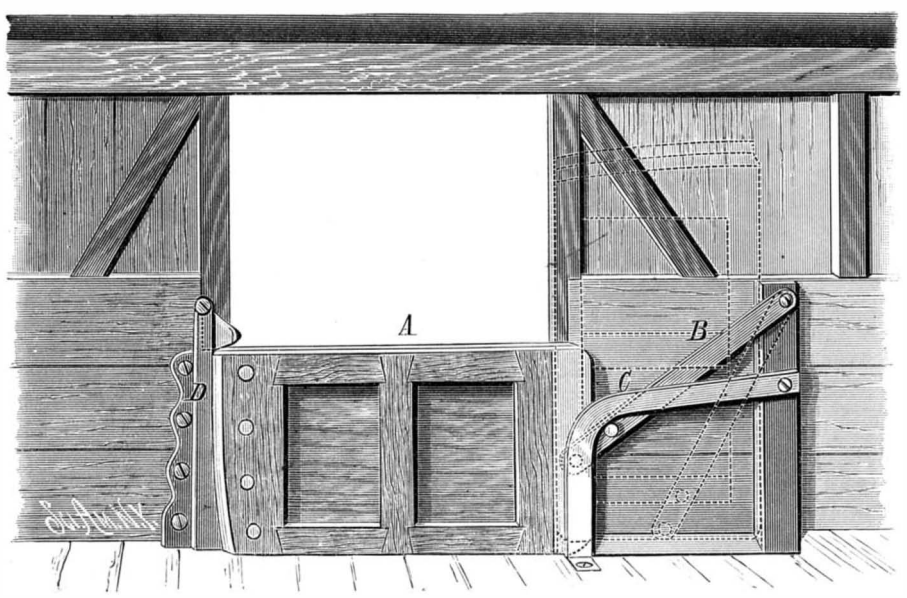

Fig. 1.—HIBBERT'S GRAIN-CAR DOOR.

When in use the door occupies the position shown in the engraving, and its free end is fastened by an eccentric latch at the top of the guard, D. When the door is not in use it is raised up out of the way as shown in dotted lines.

The continuous draw bar, shown in Figs. 2 and 3, is arranged so as to take the longitudinal strain off the car and thus dispense with one of the greatest causes of destruction to railway cars. The drawhead, A, is slotted to receive the crossbar, B, and its inner end, D, is guided between parallel timbers, C, that extend the whole length of the car. The outer end of the drawhead is supported by a stirrup in the usual way, and the inner end passes through a follower, which is pressed outward by two spiral springs, E, which are properly supported and guided in the framework attached to the bottom of the car. The arrangement of the draw bar is the same at each end of the car, and the two crossbars, B, are connected by two draw rods, F, which extend parallel with the central timbers of the car throughout its entire length. When the draught is applied by the engine the strain is transferred through the draw rods, F, to the rear end of each car of the train, thus relieving its frame of all stress lengthwise, owing to the yielding of the buffer springs at the rear end of the car and the abutting of the follower against the extremities of the buffer beams or blocks. In backing, the drawheads are pressed inward, the followers pressed against the ends of the timbers, C, and the springs are pressed back into their recesses, when they are relieved of further compression.

In backing the train the inward movement of the drawheads occurs without bending the rods, F, as the latter are slotted to admit of the movement of the crossbar, B.

Should the rods break, the drawheads are prevented from pulling out of the frame of the car by means of a key, extending through the inner end of the heads behind the followers; the strain is then transferred to the brackets in front of the follower. For further information in regard to these practical and useful inventions address the inventor as above.

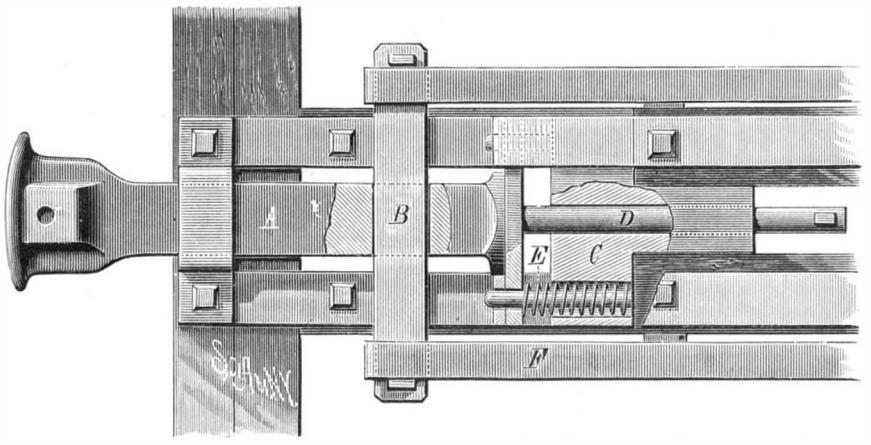

Fig. 3.—DRAW BAR.

Spontaneous Combustion of Coal at Sea.

An explosion, the result of fire by spontaneous combustion of coal in one of the bunkers of the Anchor Line steamer Alsatia, lately, compelled that steamer to return to this port. No great damage was done. The occurrence, however, calls attention to a source of danger to steamers of which we fortunately hear but little on this side of the ocean. The loss of English vessels by the spontaneous combustion of coal carried in bulk as freight, became at one time so frequent as to call out a special parliamentary commission of investigation, one curious result of which was the discovery that the burning of ships at sea was largely attributable to the working of the compulsory education act. The fires were caused by impurities (pyrites, etc.) in the coal. Boys had been employed at the mines to throw out such impurities. The new education law compelled the boys to go to school. The coal was not picked over. The sulphurets oxidized, smouldered, and took fire on ship board, and many ships were lost.

Certain Nova Scotia coals are said to carry sulphurets enough to occasion their spontaneous combustion; and some Pennsylvania bituminous coals have similarly taken fire in piles exposed to dampness; but there is no instance on record of the loss of a vessel through the spontaneous combustion of American coal. It is commonly believed that abundant ventilation will prevent the loss of coal ships at sea by this cause; but the parliamentary inquiry above referred to discovered that the better the ventilation of the cargoes, especially in hot and moist climates, the more frequent the fires.

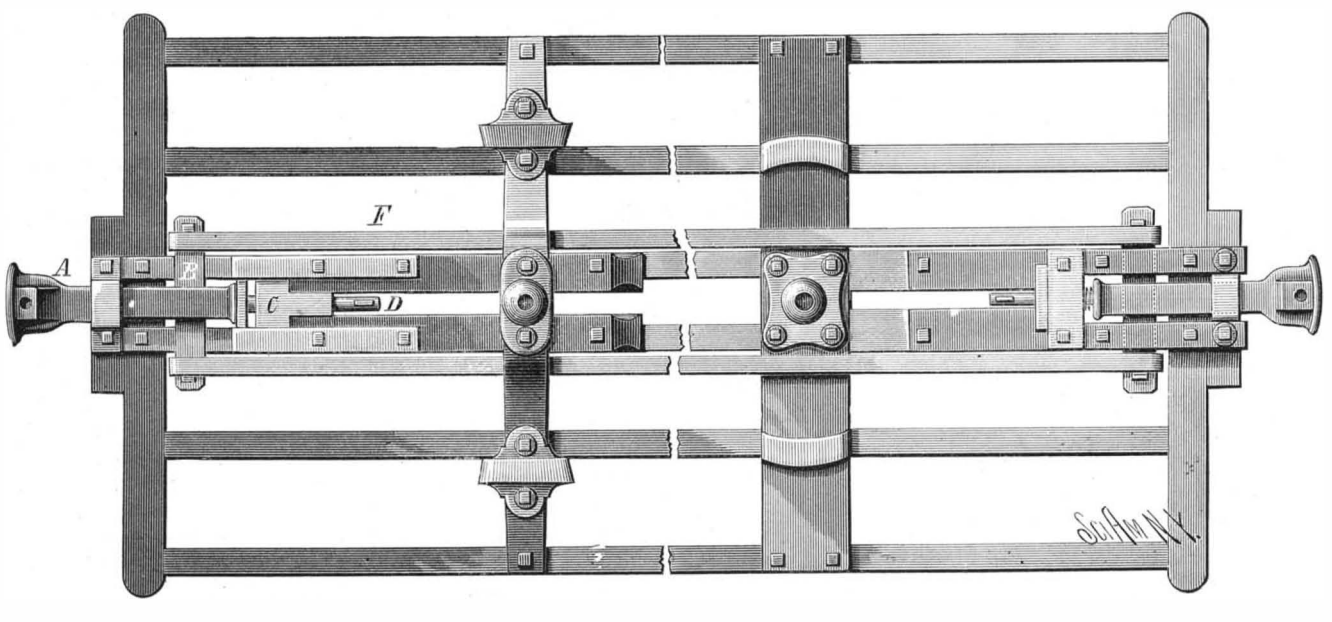

Fig. 2.—HIBBERT'S CONTINUOUS DRAW BAR.

American Architectural Tiles in England.

A correspondent informs us that at a recent exhibition at Crewe, England, of the London, Manchester, and Liverpool Agricultural Society, the first prize, gold medal, was awarded to J. & J. G. Low, of Boston, Mass., for the best art tiles in relief and intaglio. The progress of our countrymen in manufactures involving decorative art is very gratifying, and the special example here mentioned shows that the admirable methods of practical art instruction, now carried on in various schools in Boston, are beginning to produce useful results.

River Improvements.

Pittsburg sometimes ships by the Ohio River in one day more coal than would fill a train of cars 300 miles in length. All the coal used within forty miles of the river, from Pittsburg to New Orleans, is shipped out of the Allegheny and Monongahela Rivers in barges, and low water in the fall, followed by a frozen river, sends coal up several hundred per cent even in those Ohio River and Mississippi River cities that have coal mines within fifty miles of them by rail. So much cheaper is transportation by water than by rail, that the savings on the coal shipped from Pittsburg in the last ten years would have paid for the building of a railroad on the bank of the river all the way from Pittsburg to New Orleans. Poor as the navigation of the Ohio River is, its permanent suspension would destroy Pittsburg, and inflict upon all the Ohio River towns a damage which could not be repaired by a hundred million dollars' worth of railroads. France is peninsular, with the sea on both sides and not far away from her center; yet she finds her inland waterways indispensable to her prosperity, and capable of saving her more money every year than all her railways. She is preparing to extend her inland waterways at a vast expense, as a measure of economy, because they carry at a profit shipments which railroads cannot carry at all. The time is near at hand when the navigation of the Missouri River will save the people of its valley more money every year than all they now receive for their crops, and it will create lines of commerce and develop wealth which must lie dormant so long as we have to depend altogether upon railroads. Let our people come to the River Improvement Convention in this city, and take up its work in a practical way, and they will effect an emancipation that will free more laborers than that which Lincoln proclaimed in 1862.—*Kansas City Mail.*

RECENT INVENTIONS.

Mr. Alexander Atkinson, of Winterset, Iowa, has patented a simple and effective device for washing clothes and afterward wringing them without moving them from the tub.

Mr. John Herman, of New York city, has patented an improved suspender brace formed of two shoulder straps connected on the back by a transverse strap, each of the shoulder straps being attached at both ends to a separate hook plate, upon which a ring or eye of a pulley or like device catches or takes, and through which pulley a cord terminating in three button loops passes.

A simple and convenient device for holding and fastening the end of a rope has been patented by Messrs. Lester J. Bailey and Leander H. Thompson, of McPherson, Kansas. The invention consists of a snap hook having a swiveled hook or loop and a tubular internally threaded shank, into which is screwed a tapering clamping sleeve that is constructed in longitudinal sections and is provided with interior projecting points.

A stop cock, so constructed that the plug can be readily fastened and released, has been patented by Mr. Charles H. Cushing, of Tidioute, Pa.

Mr. Benjamin Maillefert, of Astoria, N. Y., has patented an improved process of and apparatus for refrigerating and making ice, in which the compressed air from a pump passes through a cooler which is supplied with a constant stream of cold water, from whence the air passes to a chamber, in which it expands in presence of steam supplied in a jet, bringing the air and particles of moisture into intimate contact.

An improvement upon that class of mortise or box door latches in which the door is securely latched whenever it is closed without the turning of knob or handle has been patented by Mr. Lorenzo Wallace, of Leavenworth, Kan

Mr. George M. Arnold, of New York city, has patented an improved device for administering medicine, etc. It consists in a bowl with a bent stem.

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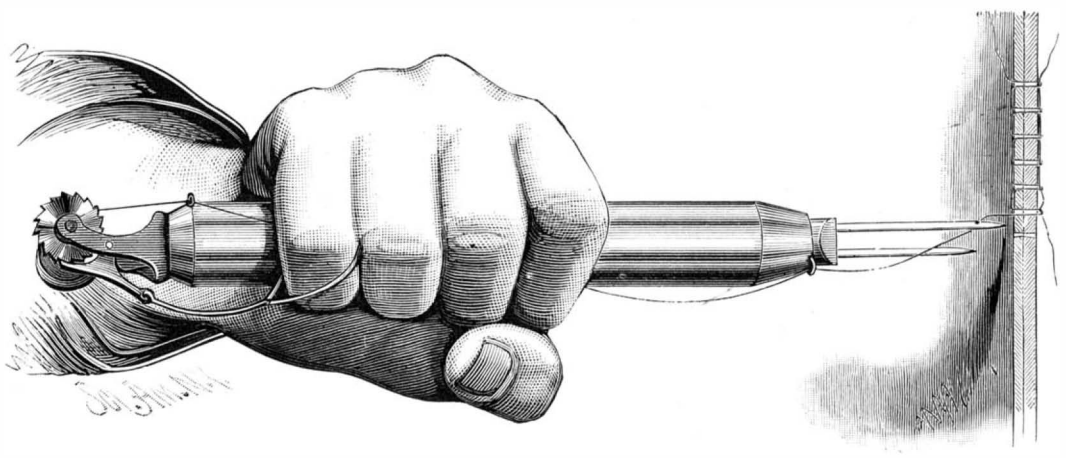
NOVEL HAND SEWING TOOL.

The engraving shows a novel tool for hand sewing recently patented by Mr. J. P. Council, of Council's Station, N. C. In using this tool a hole is first made with the awl, which is then withdrawn, and the threaded thread carrier introduced, the awl at the same time making a second hole, and so the work continues, the carrier following in the holes made by the awl. As the carrier, having carried the thread through the hole, is withdrawn, the thread forms a loop through which a threaded spindle is passed, and then the carrier is wholly withdrawn to close the loop upon the thread from the spindle, and in this manner the stitch is made.

As this tool is used the thread will freely unwind from the spool whenever it is required, and the operator, by keeping one of the fingers on a loop attached to the pawl, can at will permit or check the revolutions of the spool.

This tool is used when fine and accurate work is required. The awl makes a hole whenever the thread carrier enters the preceding one, consequently the holes are all made at equal distances apart, and the stitching presents a neat appearance.



HAND SEWING TOOL.

Pipe Lines for Tan Liquor.

In view of the exhaustion of bark in the neighborhood of large tanneries, and the cost of hauling such bulky material from distant woods, it is proposed to connect tanneries with good bark locations by means of pipe lines. Grinding mills and leaching tanks could be set up where the bark is produced, and the tan liquor conveyed to the tanneries through pipes of wood or lead. Iron pipes would not answer, as the tan liquor would corrode the iron and become blackened. The cost of pipe lines of four-inch bored logs is estimated at $1,000 a mile. It would thus be cheaper to bring the liquor to existing establishments than to move the tanneries.

Composition of Diastase.

The elementary composition of diastase has been determined by Zulkowski; he extracted it from malt by glycerol, and then precipitated it by alcohol; it was purified by repeated washings with alcohol, and was redissolved and reprecipitated several times. Eventually a product perfectly soluble in water was obtained, which had the following composition:

Carbon	47·57
Hydrogen	6 49
Nitrogen	3·16
Oxygen	37·64
Ash	3·16
Sulphur	traces.

American Wheat in Russia.

Russian journalists appear, says the London *Telegraph*, to be just now painfully exercised by the announcement that two American steamers, laden with grain, have entered the port of Revel for the purpose of discharging their cargoes, a circumstance hitherto without precedent in the annals of Russian commerce. That Russia would never need to import cereals from foreign countries has heretofore been a firmly established article of popular faith throughout the Czar's dominions. So rapid, however, has of late years been the falling off in productiveness exhibited in the agricultural districts of the empire that the seemingly impossible has at length come to pass, and Northern Russia is importing wheat from the United States. It is but justice to the Russian press to acknowledge that it has been profuse of warnings with respect to the probable consequences of slovenly and unintelligent farming, persistence in old-fashioned and exploded systems of cultivation, reluctance to invest capital in modern agricultural improvements, absenteeism, and other laches which have practically disqualified Russian grain growers from competing for foreign custom with their transatlantic rivals. But Russian buyers and peasant farmers alike were so immutably possessed by the conviction that Russia was the predestined granary of Europe that they calmly ignored these salutary monitions. They are now stricken with amazement and consternation by proof positive, such as is afforded by the importation of American grain into Revel, that the cereal yields of Northern and Central Russia no longer suffice to meet the consumptive requirements of the native population. Germany, too, is giving to America the preference over Russia for what grain she finds it necessary to import from abroad, on the reasonable grounds that the American wheat is at once cheaper and of better quality than the Russian. On the whole, Russian agriculture is just now at an extremely low ebb, and its future promises to prove even gloomier than its present.

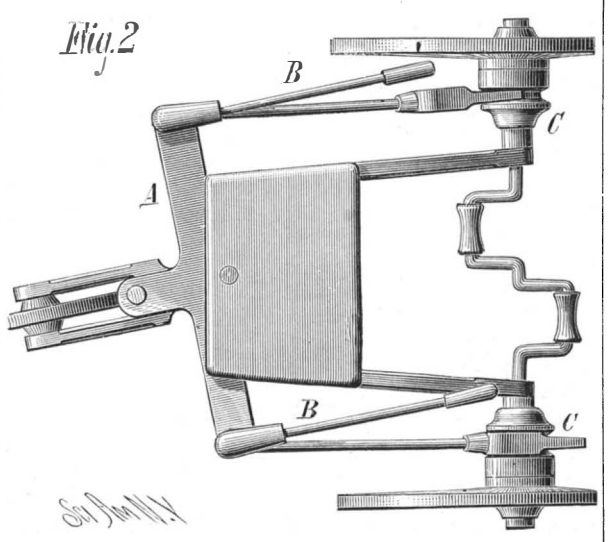
Sick Horses in Boston.

Not a little inconvenience and alarm have been caused in Boston by a recurrence of the distemper which was so fatal among horses in 1872. Hitherto the deaths have been few, but the disease is rapidly spreading, and in the large stables of express companies, omnibus and horse railroad companies, and the fire department, a large portion of the horses are sick. The disease is described as a specific epizootic fever of a low type, accompanied by inflammation of the throat and air passages.

IMPROVED VELOCIPEDE.

The bicycle has been perfected in mechanical details, and is now well adapted to the purposes of locomotion, as indicated by the large and rapidly increasing demand for them in this and other countries. It seems, however, that while a great deal of inventive talent and ingenuity have been exhibited in perfecting these carriages for men and boys, most of the efforts thus far made toward adapting a similar machine to the needs of ladies and girls have not proved satisfactory. The chief objections brought against these machines are the position of the rider, the unnatural action of the muscles in propelling them, and the difficulties connected with guiding the apparatus.

Fig. 2



PERKINS' VELOCIPEDE.

PERKINS' VELOCIPEDE.

The invention shown in the annexed engravings overcomes these difficulties and gives the rider a graceful and natural position, admits of the free use of the limbs in propelling the carriage, and affords a perfect and easy control of its direction. The difficulties heretofore experienced in guiding a carriage having one or both crank wheels fixed to the axle has been effectually overcome by the inventor, and the rider, as she supports herself and guides the carriage by the same movement, releases the wheel making the inner curve, whether running forward or backward, and sets both rigidly on the shaft when running straight ahead.

The plan view, Fig. 2, shows the arrangement of the various parts. The caster wheel, A, is operated by two handles, one at each side of the rider, and the swinging bar attached to the caster wheel support is connected with two shipper rods, B, which are capable of engaging with the clutches, C, on the crank axle.

Whenever one of these shipper rods is thrown forward by the movement of the guiding handles the wheel on that side of the carriage is released so that it may run loose on the axle. Further information may be obtained by addressing the patentee and manufacturer, Mr. N. S. C. Perkins, Norwalk, Ohio.

MISCELLANEOUS INVENTIONS.

An apparatus for use in connection with a scale, or applied to a scale beam, for the purpose of multiplying the weight as indicated by the position of the poise, by any desired figure of a fixed gauge, and indicating the result in figures, has been patented by Mr. Charles E. Allen, of Mansfield, Pa.

An improved rudder for vessels has been patented by Mr. Frank G. Mareglia, of Lussinpiccola, Austria. The object of this invention is to provide sailing vessels with means for steering, whereby the course of the vessel may be changed without making leeway; also to provide for shipping and unshipping the steering devices when not required for use.

An improved velocipede has been patented by Mr. Henry Schlüter, of Stapleton, N. Y. The object of the invention is to connect the saddle and stirrup levers of a velocipede with the cranks of axle in such a manner that the dead-point shall be avoided.

Mr. William Robinson, of Bodega (Smith's Ranch P. O.), Cal., has patented a gate so constructed that it can be opened by the wheels of an approaching vehicle, by persons upon horseback or on foot, and which is operated by a positive movement.

Mr. John P. McDermott, of Galveston, Texas, has patented a telephone which enables one to hold conversation in any position and listen without inconvenience to lectures, etc., without others in the vicinity hearing, and to prevent other sounds from interfering with those to be heard, and at the same time allow absolute freedom of the hands when speaking and hearing.

Mr. John Collins, of Brooklyn, N. Y., has patented a compound for lining gas generators, acid chambers, and fountains for mineral waters, the use of which will avoid the expense and labor involved in the ordinary method of lining said vessels.

A method of laying underground telegraph wire, and forming conduits therefor progressively, which consists in laying cement or concrete in a trench around a tubular core or mandrel containing the wires, and sliding the core forward upon the wire as the conduit is completed, has been patented by Mr. Seth E. Codding, of New Bedford, Mass.

An improved mechanism for converting reciprocating into rotary motion has been patented by Mr. Tommaso Donato of New York city. The invention consists in a rocking lever having one or two segmental racks attached thereto, which act upon sliding racks having a connecting rod of a crank pivoted between them, whereby the reciprocating motion of the rocking lever is converted into rotary motion, and the power is greatly augmented by the difference in the leverage of the rocking lever and the segmental racks, and is then transmitted to driving wheels by intermediate geared wheels.

Messrs. Alonzo H. Kimball and Charles H. Kimball, of Littleton, Mass., have patented a road scraper and grader so constructed that it may be readily adjusted to cut the ground to any desired depth, to give any required crown to the road, to move the soil without becoming clogged, and which is held firmly against side movement.

Mr. Albert Wilcox, of Clarence, Iowa, has patented an improved clamp for harrow frames, which saves labor in the construction of harrow frames and avoids weakening the bars of the frames in securing them together.

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A RESULT OF THE MISSISSIPPI JETTIES.

As a direct result of the success of Captain Eads' jetties at the mouth of the Mississippi River, is noted the present remarkable demand for huge grain carrying barges for the transportation of wheat from St. Louis to the ocean-going vessels at New Orleans. This demand for barges is supplemented by the recent purchase of several of the most powerful towboats ever built at Pittsburg, and which were originally designed for the coal trade. With 20 feet of water assured at South Pass, where the jetties are located, the river transportation of grain to ocean huils bids fair to assume proportions that must jeopardize the overland carrying of grain between the upper Mississippi and the seaboard. Within the past few weeks the St. Louis and New Orleans Transportation Company and the Mississippi Valley Transportation Company have been in the market as purchasers for steamers and barges. The latter are of the variety known in Western waters as the "model" barge, in contradistinction to the coal or square barge. These craft are built to a model, and those recently contracted for are of the following dimensions: Length 225 feet, width 36 feet, hold 9 feet. The "cargo box" or receptacle for grain has a capacity for 60,000 bushels or about 1,500 tons. At present forty such barges are being built at different yards along the Ohio River, and the total number of barges that will soon find employment in the grain-carrying trade between the points named is placed by good authority at 120. A "tow" of such barges consists, under favorable circumstances, of five, a loaded barge drawing about eight feet. To make the round trip between St. Louis and New Orleans requires twenty days, and the freight on wheat averages 8 cents per bushel. The lack of return cargoes prevents this rate from being as great a "bonanza" as would appear from an income of $24,000 for a three weeks' job. Nevertheless it is a good thing for those engaged in this wholesale way of sending grain down the "Father of Waters." As a fair sample of the amount of merchandise carried by one "tow" of barges of less size than those described above, the following is appended: The steamer Jno. Gilmore's barges arrived at New Orleans within the past week, from St. Louis, with the following cargo: 680 bbls. and 315 half bbls. flour, 188 bbls. meal, 110 bbls. grits, 4,258 sks. corn, 200 sks. malt, 55 bbls. oil, 10 bbls. apples, 380 pckgs. lard, 786 bales hay, 39 pckgs. sundries, 101,499 bushels wheat, and 25,000 bushels corn in bulk.

STRENGTH OF YELLOW PINE.

From a paper read by Prof. R. H. Thurston before the American Association for the Advancement of Science, we find some very interesting facts relative to the strength of yellow pine and other timber. Prof. Thurston made experiments for determining the modulus of elasticity, using a very large number of specimens in his trials. He found that the deflection of timber bearing a load and supported at the extremities is very nearly proportional to the load, even far beyond the customary limits of strain, and that the modulus is very nearly constant for all moderate deflections. When higher loads (as one fourth or one eighth the maximum) were imposed for a considerable time, as ten or twenty minutes, the deflection gradually increased; on removal of the weight it steadily decreased, returning nearly to its original set. Heavy loads, long applied, produced fracture of pieces, the companions to which resisted considerably more when the load was increased steadily up to the moment of fracture. The maximum permanent load was apparently something less than one half and greater than one third the maximum load which could be sustained under ordinary test.

From the whole series of experiments Prof. Thurston drew the following conclusions: The elasticity of yellow pine timber, such as is usually used in construction, is very variable, the modulus varying from 1,000,000 to 3,000,000, the average being about 2,000,000 in small sections, and a little above 1,500,000 in large timber; the highest values are given as often by green as by seasoned timber; the density of the wood does not determine the modulus, the figure varying sometimes directly and sometimes inversely as the density, even where the amount of seasoning was alike; a high modulus usually accompanies high tenacity and great transverse strength; the resistance offered to transverse stresses is greatest where the lines of grain are vertical.

Prof. Thurston recommends the designing and constructing engineer to adopt a moderate value of the modulus in proportioning a work, and by careful inspection and test to secure the rejection of all material which is not of good quality.

A NOVEL IMPORTATION.

The *American Agriculturist* states that the large tea importing house of Messrs. Billinge & Wetmore, of this city, have recently received from their correspondent in Calcutta a very unusual and out-of-the-way consignment—this consisting of several tons of mahwa flowers, to be sold as cattle food. The idea of the "*effete* East" sending food to America seems strange enough. The mahwa tree and its edible flowers have already been fully described in the SCIENTIFIC AMERICAN and in the SUPPLEMENT, and we need only add that the flowers form such a valuable food product to the natives of India that in the expeditions made by the English against troublesome tribes, they have only to threaten to cut down the mahwa trees to bring the rebellious people to terms. A sample of the flowers as imported shows a soft sticky mass, having much the appearance of raisins of a poor quality, such as are packed in casks. When soaked in water the individual corollas swell out and assume a flattened, globular shape, about as large as an average cranberry, and are found to consist of a very fleshy cup, within which are a great number of anthers. At the instance of the *Agriculturist*, the consignees had an analysis made of this interesting product, and the report of the chemists shows that the flowers contain the remarkable amount of 63·40 per cent of sugar! This enormous percentage of sugar, without reference to other constituents, fully accounts for the value attached to the flowers in India as an article of food, and for use as a source of spirituous liquors. From a scientific point of view, the mahwa is a most interesting product; for it is rarely that we find the flower, the corolla of a plant, to serve any more than as a temporary purpose in protecting the reproductive organs within. For it to secrete more than half its weight of sugar, and thus become an article of economic value, and even of commerce, is most remarkable. The future of the mahwa as an article of trade in this country will, of course, depend upon its cost; and the commercial aspect of the article remains to be developed.

THE BRITISH ASSOCIATION MEETING.

The fiftieth annual meeting of the British Science Association began at Swansea, Wales, August 25. As usual the attendance embraced a large number of the best known promoters of science in the United Kingdom. The proceedings of the first session were purely of a business character, ending with a vote of thanks to the retiring President, Prof. G. J. Allman. In the evening, President-elect Andrew Crombie Ramsey, Director-General of the British Geological Survey, delivered his inaugural address, in which he considered at great length the recurrence of the same kinds of incidents throughout all geological time; in other words, the facts bearing upon the doctrine of uniformity of action and results, from the earliest geological epochs to the present day. In this address Prof. Ramsay considered the nature and evidences of metamorphism from the Laurentian epoch down to the pliocene period, arriving at the conclusion that at no period of geological history is there any sign of volcanoes having played a more important part than they do in the epoch in which we live. Mountain formation was next considered, the recurrences of the phenomena of mountain upheaval and development being discovered in every geological age. The recurrence of beds of various salts, chiefly rock salt, and the circumstances that produced them, were found to bear further evidence of the uniformity of physical conditions and causes throughout all time. Fresh water formations, deposited in lakes and estuaries, were traced from the Upper Silurian Blani beds of India down through geological time to the later Tertiary beds, showing the recurrence of similar conditions and geological operations in all ages. And equally striking testimony was borne by the successive glacial epochs, which have left their traces in abundance in various formations from almost the earliest paleozoic times down to the last post-pliocene period of ice. In summing up, Prof. Ramsay expressed the conviction that from the Laurentian epoch down to the present day all the physical events in the history of the earth have varied neither in kind nor in intensity from those of which we now have experience.

Reports of the subsequent proceedings of the association have not yet come to hand.

GREAT AND SUDDEN CHANGES OF TEMPERATURE.

Prof. Elias Loomis, in the current number of the *American Journal of Science and Arts*, offers an explanation of the great and sudden changes of temperature which frequently occur in some parts of the United States—a circumstance of which little account has thus far been taken. A very remarkable case of this kind occurred at Denver, Colorado, on January 15, 1875. In studying these sudden changes the first fact that attracts attention is that the air at Denver and its vicinity is very dry. Only one explanation of this dryness seems possible. The westerly winds from the Pacific Ocean have their moisture mostly condensed in passing over the Sierra Nevadas, so that between these mountains and the Rocky Mountains the air is extremely dry. By passing over the Rocky Mountains there is a further condensation of vapor, so that when the air descends on the eastern side of these mountains it is almost destitute of moisture. The vapor which comes up from the Gulf of Mexico is diffused over the Mississippi Valley and mingles with the dry air which comes from beyond the mountains, so that the dryness of the air rapidly diminishes as we advance eastward from the Rocky Mountains. Between 11 P.M., Jan. 14 (1875), and 7 A.M., Jan. 15, the thermometer at Denver rose 42°. The relative humidity fell from 71 to 21. The wind, which had previously blown from the northeast with a velocity of three miles an hour, at 9 P. M. veered suddenly to the southwest with a velocity of twelve miles per hour. The direction of the wind, the dryness of the air, and its high temperature, prove beyond a doubt that this air came from the West side of the Rocky Mountains, having been brought over the latter to Denver by a storm which had its center in San Francisco on Jan. 14, and which traveled about 1,400 miles in twenty-four hours. The vapor contained in this air would be mostly precipitated on the west side of the Rocky Mountains, so that it would descend on the east side deprived of its moisture, and with a temperature above that which prevailed in the Salt Lake basin, on account of the latent heat liberated in the condensation of the vapor. This warm and dry air supplanted the cold air which previously prevailed at Denver, and which still prevailed at neighboring stations east and north of Denver. After the center of low pressure had passed Denver, the northeast wind returned and brought back the cold air which had constantly prevailed at stations not very distant. In winter, during periods of extreme cold on the east side of the Rocky Mountains, when the temperature of Denver sometimes sinks more than 20° below zero, there prevails in the Salt Lake basin an average temperature of about 30°; and when by changes of atmospheric pressure this air is carried over the mountains it may reach Denver with a temperature of 50°, resulting from a precipitation of its vapor on the mountains. We then find a mass of air having a temperature of +50° in close proximity to a mass of air having a temperature of —20°, and by the movements of the atmosphere attending the progress of a great storm these different masses of air may be brought successively over the same station, causing a change of temperature of 50° in a single hour. Other cases of sudden change, which occur so frequently in the West, admit of similar explanation.

THE FAIR OF THE AMERICAN INSTITUTE.

The fair, considering the time which has elapsed since its opening on the 15th inst., is in good order, the majority of the exhibits being in position and in condition for examination; and while the character of the Exhibition is about the same as usual, it is on the whole very creditable, both to the managers and exhibitors, and it appears satisfactory to visitors.

We miss the display of electric lights, telephones, and other electrical apparatus, prominent features of former exhibitions; but it is possible they may appear later. The amateur department inaugurated this year is not as well patronized as we expected it would be, and most of the amateur exhibits are not creditable to our amateurs as a class. The photographic exhibits are evidently not all in place, but some that are to be seen are very fine. Mr. Rutherfurd shows several interesting photographs of solar spectra.

In the main building are a number of exhibits of which we may speak later.

In the machinery annex the main lines of shafting are driven by two fine horizontal engines, a Wheelock engine of 150 horse power, and a Whitehill engine of 50 horse power. An Otto gas engine of 7 horse power is connected with a line of shafting which drives several light wood working machines made by H. B. Smith. The New York Safety Steam Power Company exhibit several of their inverted vertical engines, and the Baxter engine is to be seen in different sizes. Colts' disk engine, made by the Colts Fire-Arms Manufacturing Company, is shown. It employs six pistons working in as many cylinders. The ends of the pistons act directly on a wabbling disk which carries the crank on the main shaft. In the line of woodworking machinery we find very little that is novel, although several of the prominent manufacturers are represented. Machinists' tools are almost entirely absent.

The Peerless Punch and Shear Company exhibit several foot and power presses, for descriptions of which we refer the reader to back numbers of this journal.

Among the novelties we find Allen's automatic grain weigher and register for weighing grain in the running stream. This machine takes care of itself, and weighs with perfect regularity, keeping tally of the amount of grain weighed with mathematical accuracy. A curious little machine for making cornucopias for putting up candies, groceries, seeds, etc., is exhibited by D. W. Seely, of Albany, N. Y. The paper goes through this machine literally "flying," and cornucopias are turned out at the rate of three hundred per minute.

Donald McKay.

Donald McKay, the once famous ship builder of East Boston, died at Hamilton, Mass., September 20. For many years his ships were in great demand. One of his first ships was the Washington Irving, for Enoch Train & Co.'s line of Liverpool packets. From that time until 1851 Mr. McKay built the Anglo-Saxon, 894 tons burden; New World, 1,404 tons; Moses, 700 tons; Anglo-American, 704 tons; A. Z., 700 tons; Jenny Lind, 533 tons; L. Z., 897 tons; Plymouth Rock, 960 tons; Helicon, 400 tons; Reindeer, 800 tons; Parliament, 998 tons; Moses Wheeler, 900 tons; Cornelius Grinnell, 1,118 tons; Sultana, 400 tons; Antarctic, 1,116 tons; Daniel Webster, 1,187 tons (lost at sea, 1853); Staghound, 1,534 tons. The discovery of gold in California created a demand for fast sailing vessels, and it was then that Mr. McKay's idea of clipper ships came into notice. Early in the season of 1851 he built the famous clipper ship Flying Cloud, 1,700 tons burden, which, under the command of Captain Cressey, made the extraordinary passage from Boston to San Francisco in 89 days. Mr. McKay, not satisfied with this, produced, in 1852, the Sovereign of the Seas, of 2,400 tons burden, the largest, longest, and sharpest merchant ship afloat at that time. She did not make so quick a passage to California as the Flying Cloud, yet, although she was dismasted, she beat the entire fleet of clippers that left at the same time by seven days, and on the homeward passage made the greatest run ever recorded.

Late in the fall of 1853 Mr. McKay launched the Great Republic, the largest merchant ship ever built, measuring 4,556 tons, and spreading 15,653 yards of canvas in a suit of sails. In the construction of this mammoth vessel, 1,500,000

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feet of hard pine, 2,056 tons of white oak, and 336½ tons of iron were used. Fifty thousand days' work were done on her hull alone. She was towed to New York, but, while there, took fire and was burned at the wharf. Her upper works were rebuilt, and her size reduced about one-third. Her greatest speed has been 413 miles in twenty-four hours. Mr. McKay built many vessels in 1854 and 1855, but in the latter year the ship-building interests began to decline. His last ship was The Glory of the Sea.

AMERICAN INDUSTRIES.—No. 57.

THE MANUFACTURE OF PARLOR FURNITURE.

It is said that when Jenny Lind first visited America, and after she had been some time in New York City, she inquired where our "poor people" lived. She saw so many signs of thrift, comfort, and prosperity everywhere, so many evidences of culture in every class of people with whom she came in contact, the residences so commodious, and the people so well clad, in comparison with what she had seen in the Old World, that it appeared to her, even after she had been for some time in New York, that she had only become partially acquainted with real life here. In the prosecution of no other one line of business, perhaps, is this distinction so clearly brought out as in the industry which we this week make the subject of our first page illustrations. In no other country in the world has such an industry heretofore been possible, carried on in the manner and according to the scale on which it is here conducted, for, although it is true that equally beautiful and far more elaborate specimens of household furniture and decoration are to be met with in the mansions and palaces of the older countries of the world, such work there is almost always made to order, and obtainable only by the few, at a cost far exceeding the price of quite as serviceable and very similar goods here.

There has been a rapid development of this branch of business within the past twenty years, and with its growth has come a natural division according to which the different specialties are made exclusively by particular manufacturers. The manufacture of dining-room and chamber furniture each constitutes separate lines of business, while parlor furniture is a specialty of itself, and the leading details of this department of the trade are shown by our artist, as the industry is conducted by Messrs. M. & H. Schrenkeisen, of New York City.

The first operation in the manufacture is represented by the view at top of first page, where the log, as it comes to the factory, is taken by a large band saw and cut into the thicknesses and lengths required. This saw runs on a wheel about five feet in diameter. An adjoining view shows a smaller band saw, used to cut up plank and boards and further divide the lumber into the different sizes to fit it for the several pieces to be made. There are seven of these band saws and nine jig or scroll saws in constant operation. The wood having been cut to the required size, the first detail of the manufacture consists in the marking of the patterns thereon. This was formerly done with a pencil, but now stencil patterns are made in zinc, by which the pattern is so plainly shown on the wood that there is much less liability to error in cutting than was formerly the case.

Previous to the work on the jig saws, nearly all the pieces have to go to the boring machine, where holes of different sizes are put through such parts of the pattern as required to enable the workman to pass through the end of the saw in cutting out the design. These holes are usually bored in places where the curves are so small that it would be difficult to work them out with the saw, although some of the jig saws are less than an eighth of an inch wide. The workmen in this department, however, from long practice, are able to follow the intricate patterns with such firmness and facility that the most complicated designs are worked out with great rapidity, and apparently without the least pause or hesitation.

The friezer, or machine carver, shown in one of the views at the top of the page, takes up but little room, but the variety of work it will do is almost unlimited. There are several modifications of this machine, for different classes of work, but the essential principle in them is the revolution, on a small axis, of different shaped knives, according to the design of the work, the wood being pressed against the knives in the line of guides and gauges adjusted to the particular pattern. In this way the machine may be adjusted to do almost any kind of carving desired, but it is found more economical in practice to do a large proportion of the carving by hand, rather than fit up the knives and patterns for the machine for all the new and elaborate designs in carving which are always being introduced.

The variety moulder, shown in one of the illustrations, represents only one of several machines in operation for this department of the work, but it is one which will cut almost everything known to the trade in the way of mouldings. The planing and turning machines, which are also the subjects of separate views, are of several sizes, and of patterns entirely familiar to all wood-workers, but the "jointer" is a machine less commonly known. It is to put a smooth edge or corner on pieces to be joined together, and it makes the edges and angles, either flat or any desired bevel, so smooth and even that when two pieces of wood of the same grain are placed together it is difficult to see where they join. The sand-papering machine shown at the bottom simply represents arms covered with sand paper, which are made to rotate very rapidly while the workman passes the rough surfaces over them to smooth off the unevenness made by the saw or planer.

The carving by hand, of which a view is given in one of our illustrations, forms a very important part of the work done at this establishment, at which from thirty to forty expert hands are kept regularly employed. This work is all done by the piece, from original designs gotten up by the house, the firm being constantly engaged in contriving something new which is likely to please the artistic taste of the community. In this way they will get up a suit of parlor furniture, subject it to criticism, make possibly considerable alterations in it, decide on the different ways in which it will be upholstered, and then have from one to two hundred sets made of this particular style. No one outside of their own immediate business is allowed to know what their new designs are until these sets of furniture are finished and ready to put on the market. In short the firm take the log as it comes from the woods, and do every part of the work necessary to make therefrom the completed furniture as it appears in the parlor, and all from new and original designs of their own.

One of the most important details of the work, without the most sedulous care in regard to which it would be impossible to make durable work, is the proper seasoning of the lumber. Only the best seasoned wood is used to start with, but it is almost impossible to thoroughly season a thick plank all through. After the work is cut out in the rough, therefore, the pieces all go to the drying room, a large apartment with slatted floors, under which run steam pipes, by which the temperature can be kept up to and above 100° Fahrenheit constantly. In this way the moisture is thoroughly evaporated, and all after danger of cracking from exposure to unusual warmth is avoided, as the finely finished work, in which the pores of the wood are all closed, and its surface has a glass-like polish, will not allow of its afterward absorbing moisture from the air. The cracking which sometimes happens in very old furniture does not arise from this latter cause so much as from the improper gluing of panels, etc., a detail which here receives careful attention.

The upholstering and finishing of the work is all done at the warerooms, on Elizabeth street, near Canal street, where the firm occupy a six story building, L-shaped, but covering a space equal to 50 by 150 feet. This building, as also the factory on Monroe street, 100 by 100 feet, and six stories high, are shown in the view in the center of the page. A 100-horse power engine furnishes the power required at the factory, and this is run almost entirely by the shavings and turnings made in the work.

Most of the goods now made are of cherry, "ebonized," as it is called, and black walnut. The ebonizing is done by dipping the furniture in an acid coloring bath, which turns it black and eats its way into the wood so as to give more than a surface coloring, and a scratch or light cut shows black underneath. In this style of furniture a large portion is finished with lines, bands, and beading in gold leaf, though some of it is also made in plain black, either brightly polished or what is called a dull finish. In the upholstering department the final work of finishing is never put on the goods until just before shipment, as finished furniture of the finest quality requires great care. In sofas, easy chairs, rockers, etc., steel springs, hair, and moss, are used, as may be required for different kinds of goods, but only the best qualities of any kind of stock are employed, and, although a fine finish is always obtained, the work is throughout of the most solid and substantial character.

The firm are the owners of several patents connected with the furniture manufacture, among the most successful of which have been their patents on spring rockers, for which they had a great run for several years after they were introduced, and which still form a leading article in the trade. They have also obtained a number of patents on band embroidery trimmings and coverings. The most of the goods used for coverings are imported, orders being given on samples sent here by European manufacturers, with the agreement that the firm shall have the exclusive control of these styles for a definite period, or until they shall have had time to put their goods on the market. The variety of these coverings is very extensive, embracing almost everything in the way of raw and finished silk, figured stuffs in satin, tapestries, reps, serge, damask, plush, etc., the patterns of only a small portion of which can be found in the large and handsome illustrated catalogue issued by the firm. In order, however, to keep their customers and agents fully informed in regard to the new styles they are constantly getting out, they have a photograph establishment fitted up in one portion of their warerooms, where they make prints of each new set of furniture when it is ready to put upon the market, and from which they receive orders from agents and dealers.

The firm have already done some business in the way of exporting furniture, but the foreign demand for ready-made upholstered parlor furniture, which is the particular specialty of this house, is relatively far less than is the call for these goods in our own country, where almost every well-to-do mechanic has his parlor, or "best room," furnished in a way which is almost unknown among the same classes in other parts of the world.

DECISIONS RELATING TO PATENTS.

By the Acting Secretary of the Interior.

EX PARTE GREAVES.—CONDENSING CYLINDER FOR CARDING MACHINES.

Bell, Acting Secretary.

1. The Commissioner of Patents may issue a patent for one or more of the divisions of a reissue application, and subsequently issue a patent to the applicant for the remaining divisions, if it be held that otherwise he is entitled to them.

2. Until an application for reissue is ended in all its divisions the vitality of the original patent continues so far as required to support that portion of the application which remains undecided.

By the Commissioner of Patents.

EX PARTE LEE.—COUPON RAILWAY TICKET.—APPEAL FROM THE EXAMINERS-IN-CHIEF.

Marble, Commissioner:

1. The patentable features of a railway or other ticket, like those of any other substantive thing, must depend upon peculiarities of mechanical construction.

2. The printed matter upon a ticket is nothing more than an arbitrary direction as to how such ticket is to be used, and can have no bearing upon the patentability of the ticket itself.

3. A railway ticket anticipated by an internal revenue stamp where the system and the manner in which it is carried out is substantially the same.

4. Duplication of checks or coupons as a matter of expediency, obviously suggested by the necessity of the case, does not require invention.

THE FRANKLIN SEARCH EXPEDITION.

The members of the Franklin search party under the command of Lieutenant Frederick Schwatka, U. S. A., were picked up, August 1, by a New Bedford bark, at Depot Island, Hudson's Bay, where they had been since March 4. The party had been for two years exploring the regions north and northwest of Hudson's Bay in search of relics of Sir John Franklin's expedition. Reports of the first year's work were received and published about a year ago. Having come to the conclusion that the records of the Franklin expedition might be preserved in cairns in King William's Land, Lieutenant Schwatka set out on the first of April, 1879, to look for them. During the succeeding eleven months he accomplished the longest sledge journey ever made in an unexplored Arctic country, traveling in all 3,251 statute miles. It was the first sledge journey ever made that covered an entire Arctic winter; and the temperatures experienced exceeded in frigidity anything ever before encountered by white men in the field.

On January 3, 1880, the thermometer sank to 71 degrees below zero, Fahrenheit, or 103 degrees below freezing point, and during the entire day it did not rise above —69 degrees. During sixteen days the average temperature was 100 degrees below the freezing point, and during twenty-seven days it was below —60 degrees. All this time the party traveled, in fact they never halted a single day on account of the cold.

During the summer and fall of 1879 they made a complete search of King William's Land and the adjacent mainland, traveling over the route pursued by the crews of the Erebus and Terror upon their retreat toward Back's River, and while so engaged the party buried the bones of all those unfortunates remaining above ground and erected monuments to the memory of the fallen heroes. Their research established the mournful fact that the records of Franklin's expedition are lost beyond recovery.

A large quantity of relics were gathered by the party to illustrate the last chapter of the history of Sir John Franklin's expedition. From each spot where the graves were found a few tokens were selected that may serve to identify those who perished there. A piece of each of the boats which had been found and destroyed by the natives was brought away, together with interesting though mournful relics in the shape of the prow of one of their boats, the sledge upon which it was transported, and part of the drag rope upon which these poor fellows tugged until they fell down and died in their tracks. In addition to these the party secured a board which may serve to identify the ship which completed the northwest passage.

They also brought the remains of Lieutenant John Irving, third officer of the Terror, which were identified by a prize medal found in his opened grave. The party endured many hardships and were threatened with starvation after their return to Depot Island, where they failed to find the supplies which were to have been left there for them by the schooner Eothen. The party suffered no serious sickness while in the field.

A Remarkable Group of Solar Spots.

To the Editor of the Scientific American:

One of the very finest groups of sun spots it has ever been my pleasure to witness was observed by me through the five-inch Newtonian telescope yesterday morning, September 12, 1880. It was situated then about midway from the center of the sun's disk and the western limb south of the equator. Its length was enormous, occupying a space equal to one-quarter of the sun's diameter, and therefore over 200,000 miles in length. I present herewith a sketch made of the group at the eyepiece of the telescope, and which conveys but a faint idea of its grandeur. At A and B were quite large spots, surrounded by a very delicate penumbra, while at C was a most beautiful cluster of small spots. The whole group was remarkable for its brilliance and distinctness. In addition to this large group there was a fair-sized single spot near the center of the disk, with a faint penumbra and dark markings in its vicinity; also a faint double spot below this one.

WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y.,
September 14, 1880.

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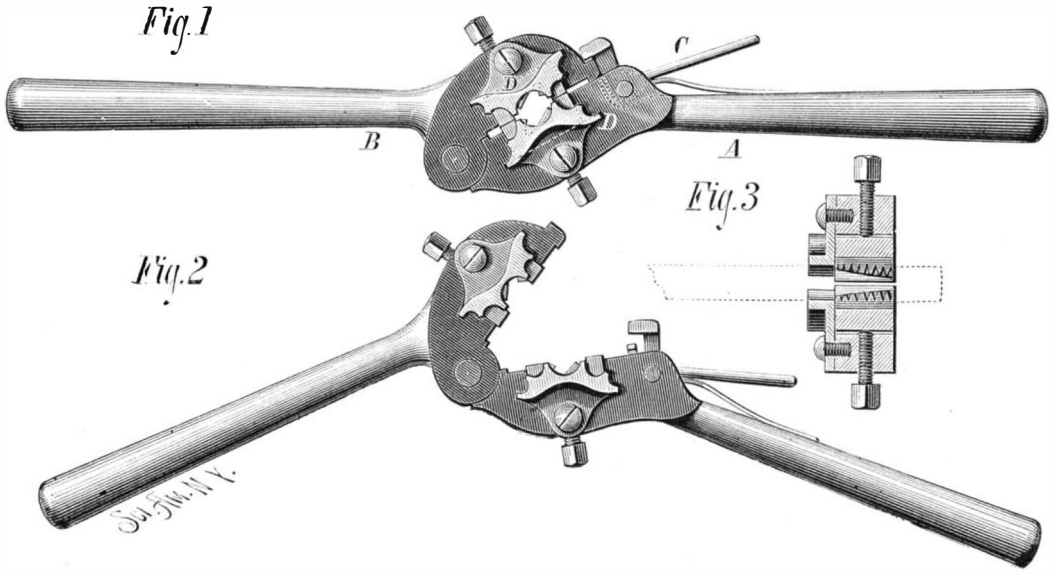
IMPROVED DIE STOCK.

The engraving shows an improved stock for holding screw-cutting dies which affords all the advantages of a solid die as well as the desirable features of a separable die. It saves about half the time and labor usually required in screw cutting, as the die can be removed from the work after cutting the screw without running it back.

The two parts, A B, of the stock are hinged together and join each other diagonally. A spring catch, C, on one half engages a projection on the other half when the stock is in use. The die is of the usual pattern, except that it is divided instead of being solid. It is retained in mortises in the stock, and to each half of the stock is pivoted a segmental guide piece, having in its edge semicircular recesses, the opposing recesses forming a circular sleeve or guide which fits the rod or pipe to be threaded. The recesses vary in size to adapt the guides to different sizes of pipe or rod. While cutting a thread the stock and die are used in the ordinary way, but when the thread is completed the part, A, is released from the part, B, by pressing on the long arm of the catch, C, when the two parts are separated as shown in Fig. 2, and removed from the work. Fig. 3, which is a transverse section of the stock and die, shows the relative position of the stock, die, and guide.



WALKER & WILLIAMS' DIE STOCK.

With this tool threads can be made quickly and easily, and also more perfectly than with the solid die, as all the difficulties arising from the clogging of the die by chips, and tearing the threads in efforts to remove the clogged die in the usual way, are avoided.

This invention is now on exhibition at the American Institute Fair. The patentees, Messrs. Walker & Williams, of Sing Sing, N. Y., should be addressed for further information.

A NOVEL TENT.

A convenient tent, adapted to the wants of excursionists, tourists, sportsmen, etc., is shown in the annexed engraving. It is light, portable, and easily set up and taken down, and affords a convenient and desirable shelter or shade.

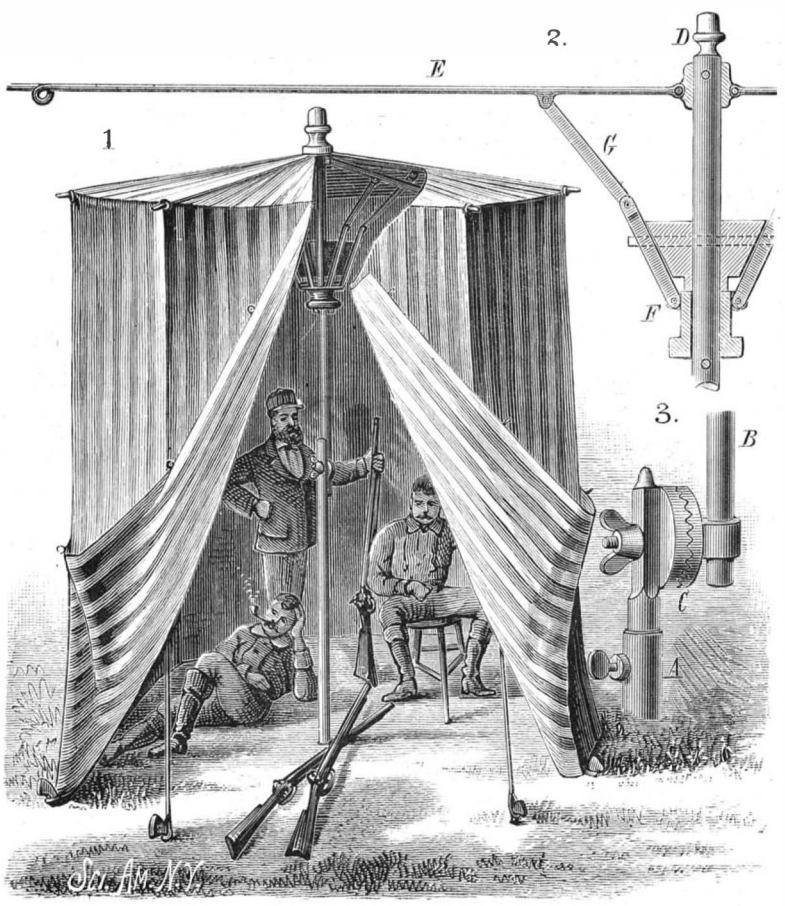
The construction of the frame is very simple, being somewhat similar to an umbrella frame. The tent is shown complete in Fig. 1, and Figs. 2 and 3 are detail views of various parts of the tent frame.

The tubular standard, A, which receives the pole, B, has a pointed end to facilitate driving it into the ground. The pole, B, has an adjustable joint, C, by means of which the frame may be inclined at any desired angle, and securely fastened by turning the wing nut. The upper end of the pole is provided with a head block, D, to which are pivoted the ribs or arms, E, which support the canvas forming the top of the tent. A slider, F, is connected with the ribs by braces, G, which are jointed in the middle to facilitate folding and packing the frame. The ends of the ribs, E, have an eye formed in them for receiving a cord to assist in supporting and stretching the tent covering.

When it is desired to use the tent in a hall or upon a platform, the lower end of the standard, A, is inserted in a cross-shaped foot formed of two pieces of plank fastened together at right angles to each other.

This tent forms a convenient shade and shelter for working animals while at rest, and will often be found convenient for covering goods of various sorts when piled out of doors.

This invention was recently patented by Mr. A. E. Shemeley, of Jamesburg, N. J., who should be addressed for further information.



SHEMELEY'S IMPROVED TENT.

Talk Over What you Read.

Nearly forty years' experience as a teacher, says a writer in the *Christian Union*, has shown me how little I truly know of a subject until I begin to explain it or teach it. Let any young person try the experiment of giving in conversation, briefly and connectedly, and in the simplest language, the chief points of any book or article he has read, and he will at once see what I mean. The gaps that are likely to appear in the knowledge that he felt was his own will no doubt be very surprising. I know of no training superior to this in utilizing one's reading, in strengthening the memory, and in forming habits of clear, connected statement. It will doubtless teach other things than those I have mentioned, which the persons who honestly make the experiment will find out for themselves. Children who read can be encouraged to give, in a familiar way, the interesting parts of the books they have read, with great advantage to all concerned. More than one youth I know has laid the foundation of intellectual tastes in a New England family, where hearty encouragement was given to children and adults in their attempts to sketch the lectures they had heard the evening previous. The same thing was done with books.

Centrifugal Force in Millstones.

An accident, notable by reason of its rare occurrence, took place at the City Flour Mills, Pittsburg, on the morning of the 7th of September. It was the bursting by centrifugal force of a French burr millstone, resulting in the instant death of Mr. Manning, one of the oldest millers in the country. The stone was made in Buffalo, N. Y., and had been in use only two years, was banded and put together in apparently first-class style. No defect was evident upon investigation. At the time of the accident the supply of grain had become exhausted, and though the only person competent to throw light upon the circumstances was killed, it is believed that this failure in the feed so increased the speed and heat of the burr as to produce the fatality described. The usual rate of speed for this stone was 200 revolutions per minute.

Laundry Machines.

The *National Laundry Journal*, which ought to know what improvements are needed in laundry establishments, thinks, while perfection in washing machines has been nearly reached, there is a field for improvement in other branches of the business. The washers, it says, are very near perfect, but there is much other apparatus used in laundry *operandi* that is susceptible of improvement, and if our inventive geniuses would give us something way ahead of anything at present in existence, we would not only give them a big obituary notice when they are called to climb the golden stair to Paradise, but we would almost be willing to guarantee them a fortune in the sale of their improvements.

The Pharmaceutical Association.

The twenty-eighth annual meeting of the American Pharmaceutical Association was held in Saratoga, September 14 to 18. A fine display of drugs and chemicals was an interesting feature of the meeting, over fifty leading druggists and manufacturing chemists being represented.

ENGINEERING INVENTIONS.

A traction engine, so constructed that the tracks may be carried forward by the drive wheels and kept securely in place, has been patented by Mr. David J. Havenstrite, of Newark, N. J.

Mr. Charles R. Simey, of Sunderland, England, has patented an improved steering gear, which consists of improved self-acting apparatus constructed and arranged to shut off the steam when, or just before, the helm attains the desired position. The position to be given to the helm is indicated by a pointer moved by the steersman, the actual movement of the helm being indicated by another pointer moved in turn by the machine itself, and the steam being automatically shut off when these two pointers coincide.

Mr. William Hadden, of Brooklyn, N. Y., has invented a novel electric signaling instrument, which is so constructed that the circuit closer will be stopped automatically as soon as the signal is given, and held in place until the signal is to be repeated. The invention consists in a block having a ring groove, in the bottom of which there are contact points connected with the circuit wire. A spring crank arm, connected with another circuit wire, is capable of touching all of the contact points in making one revolution. A stop arrests the arm at the end of the revolution, and a spring latch drops into a notch in the block and prevents retrograde motion. When a second signal is to be sent the crank arm is released from its stop by pressing it inward, when it may be turned until it again strikes the stop.

Bathing.

It is important to recognize that the only virtues of water as used by the bather are two—namely, its value as a cleansing agent, and as a surface stimulant. In this last capacity it simply acts as a medium affecting the temperature of the part to which it is applied, or which is immersed in it. Right views of fact in reference to this matter are important, because there can be no question that some persons overrate the uses of cold water, and run considerable risks in their pursuit of them. Every beneficial action that can be exerted by a bath is secured by simply dipping in the sea, or a very moderate affusion of cold water! Except in cases of high fever, when it is desired to reduce the heat of the body by prolonged contact with cold, a bath of any considerable duration is likely to be injurious. Then, again, it is necessary to recognize the risk of suddenly driving the blood from the surface in upon the organs. The "plunge," or "dip," or "shower," or "douche," is intended to produce a momentary depression of the temperature of the surface in the hope of occasioning a reaction which shall bring the blood back to the surface with increased vigor, and almost instantly. If this return does *not* take place; if, in a word, redness of the skin is not a very rapid consequence of the immersion, it is impossible that the bath can have been useful, and in nine cases out of ten when the surface is left white or cold it does harm. The measure of value is the redness which ensues promptly after the bath, and this reaction should be produced without the need of much friction, or the bath is not worth taking. The rubbing employed to recover the circulation lost by the bath would probably have done more good without it! Another effect of the bath when it acts properly is to stimulate the nervous system, through the vast series of its terminal fibers which are distributed in the skin. In this way also the action must be very rapid, or it is not efficacious. Unless the vigor of energy is quickly called out, the agent is useless; and if it produces either drowsiness or depression it acts mischievously; and lowers the power it is intended to stimulate and augment.

Bathers should bear these facts in mind, and be warned by them not to trifle with an agency which, if it is not of value, is worse than useless, and can scarcely fail to do harm.—*Lancet.*

WATERPROOFING CLOTH.—Cloth coated with linseed oil to which a little wax and litharge have been added, will be waterproof.

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The Ferocious Frog.

The London *Telegraph* relates the following story of the curious propensity of the frog, alleged to have been discovered during the draining of some huge carp ponds upon Count Schaafgotsche's estate of Warmbrunn. Upon transferring the fish from these preserves to baskets, for the purpose of conveying them to tanks wherein they might disport themselves while their old familiar quarters were being cleansed, it was observed that frogs were clinging to backs of many of the larger carp. Most of the fish thus beridden were blind, the frogs' fore feet being found firmly fixed in the eye sockets of their victims.

Interrogated respecting this strange phenomenon, the chief pond keeper told our contemporary's informant that, according to his experience, extending over several years, frogs were the deadliest enemies with which carp had to contend, and caused an annual mortality among the fish under his care of from 3 to 4 per cent of their total number. The frog's object in bestriding the carp, he said, was to feed upon the slimy matter that so frequently forms a sort of spongy crust on the heads and backs of the older fish; and, once settled in their favorite seat, they speedily succeeded in gouging their finny steeds, which, when blinded, being unable to look out for their food, soon perished of hunger. How tightly these voracious batrachians hold on to their living pastures was exemplified by the pond master, who picked up a carp weighing two pounds and a half, and held it suspended in the air by one of the hind legs of a frog perched upon its back in the manner above described. Carps thus frog ridden to death begin to turn yellow on the third day after the parasitical croaker has taken his seat, rapidly waste away, and generally die within a fortnight from the commencement of their martyrdom. In clear water it is pretended that they can espy their nimble foe as he prepares to spring upon them, and by a timely wriggle often escape his attack; but in dim and slimy old ponds, like those of Count Schaafgotsche, they too frequently fall a victim to his saltatory skill and merciless appetite.

Alaska Seal Skins.

During one week recently 950 casks of Alaska seal skins arrived here by the Pennsylvania Railroad. They, with 450 casks more to come, were going to London to be dressed for market. The consignment contained about 92,500 skins, and was valued at nearly $1,000,000. The cost of freight to this point was almost $600 for a carload of forty casks. The skins are tied in oblong bundles and pickled in salt. It requires eight skins to make a full sack, and they have to be dressed and dyed by London furriers and then reshipped to this country.

THE CORAL SIGNET OF THE KING OF ITALY.

Among the beautiful pieces of coral exhibited by Messrs. Mazza, Guiseppi e Figli, from Torre del Greco, near Naples, at the Berlin International Fisheries Exhibition, was a branch of coral weighing eleven pounds, valued at $3,000, and another branch, in three colors—white, pink, and red—and which has been in the hands of the family for two hundred years. Further, a necklace valued at $6,000, and, finally, the beautiful coral signet represented in the annexed engraving, for which we are indebted to the *Leipziger Illustrirte*

THE CORAL SIGNET OF THE KING OF ITALY.

Zeitung. The signet is cut from a bright-red piece of coral, and is a representation of the royal family of Italy. On the top we find the portrait of the late King Victor Emmanuel, below him, at the right, the present Queen Margaruite, at the left the present King Humbert, and below the latter two their son, the Crown Prince, surrounded by flowers and emblems. The firm of Mazza presented this signet to the King, who accepted it, but desired to have it exhibited at the Berlin Exhibition before taking permanent possession of it.

THE MOLLUSKS AT THE BERLIN FISHERY EXHIBITION.

We have given illustrations of various parts of the Berlin Fishery Exhibition, and of the animals exhibited there, and now we add another cut representing the "mollusca."

Fig. 1 represents the *Rhizostoma aldrovandii*, whose transparent disk, ornamented with blue, violet and scarlet stripes, attains a diameter of two feet. A series of transparent gelatinous members are suspended from the under side of the disk, and carry the stomach of the animal, which terminates in eight wonderfully fine tentacles. By contracting the disk or bell the animal can propel itself and can change the direction of its movements. The specimen we have represented is the first of its kind that was ever brought to Berlin alive, and has given opportunity to observe very many of its peculiarities. It constantly remains above the opening through which the clear water containing a surplus of oxygen is admitted into the tank.

In Fig. 2 the most beautiful representative of the class of medusæ, known as the *Turris digitalis*, is shown, and resembles a balloon woven of the finest and most transparent of materials. The dark spots in the interior represent the organs of generation, which are of a strawberry-red color. The tentacles are of a glaring white, and have an ordinary length of about one to one and a half inches, but can be lengthened to eight or nine inches in an instant.

The *Cydippe brevicostata* (Fig. 3) has not been so profusely provided with ornamental appendages as the other members of the medusæ family. The development of the medusæ is highly interesting and instructive, on account of the changes which take place in its generation. The egg passes from the female organ in an infusorial form, and swims about in the ocean a short time by means of the hairs that cover it, and finally attaches itself to some sea plant, rock, etc. Here it develops itself into a polypus provided with tentacles. In a short time contractions take place, so that the animal represents a series of flat glass cups or saucers placed above each other, and finally each of these cups is separated from the main body and is an independent animal. Before the discoveries of Ehrenberg the above polypus had been treated as being a distinct kind of animal and belonging to a certain class.

A most peculiar inhabitant of the ocean is the *Tethys fimbria*. It has a series of knotted rudimentary branches, containing the gills, on the back. The head consists of a large cape with two side wings, called the sails, and containing the eyes; and the mouth consists of a funnel-shaped opening under the cape. The parts shown on the back of the animal drop off as soon as they are touched, and have vitality for a short time.

We are forced to place the wool-crab, Fig. 5 (*Dromia*

THE MOLLUSKS AT THE BERLIN FISHERY EXHIBITION.

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vulgaris), among all these beauties, but the peculiarities and oddities of his manner of living will compensate the observer for the lack of beauty. The reddish-brown mass on his back is a cork-sponge (*Suberites domuncula*), which keeps company with him. If the sponge is detached from the crab, and both are placed in a tank, the spectator will see a most humorous performance, for the crab will endeavor to procure his mantle and will make the most frantic attempts to get it; in fact he will behave about in the same manner that any person would that has been deprived of a very much needed garment. If he finally gets his covering again he places it upon his back, shifts it, tries it, and after many attempts is at last satisfied. The crab disguises himself by means of the sponge, which grows so rapidly that it is ofttimes difficult for the crab to reserve for himself the freedom of movement for his limbs and continually munching jaws. The crab generally locates himself in the neighborhood of other sponges and there waits for his prey, either attacking them in open fierce combat or in his sly and stealthy way, of which it is a great favorite.

The nests of the weaver bird or the stickleback fish are real masterpieces of animal ingenuity, and are deserving of the praise they call forth; but if we remember that the intelligence of vertebrates is far superior to that of the mollusca, we cannot do otherwise than admire the nest building file-shell (*Lima hians*), Fig. 6. The shell is absolutely white, and fringed by numerous orange-colored tentacles, which serve to furnish the food and the breathing water, as also to build the nest.

The peculiar nest, which is built of small pieces of shells and stones, connected by very fine threads that the animal spins, resembles a fortress, from the main entrance of which the tentacles of the shell project in a defiant manner. The *Lima* swims very well, and drags its tentacles along like the tail of a comet.

The finger date shell (*Lithodomus dactylus*), shown in Fig. 7, bores through the hardest rocks slowly but surely. Schleiden relates the following in regard to it: The temple ruins of Serapis are situated near Puzzuoli (in the Bay of Naples), and three of the columns still stand erect. The columns are of the most beautiful Cipollini marble, and the first seventeen feet are perfectly intact and smooth, but the next seventeen feet have been perforated by numerous date shells, and in some of the apertures the shells are still to be found. The remaining forty-five feet of the columns have been very much affected by the atmosphere. All this is very easily explained, if we assume that the ground upon which the temple stands settled so that the columns were immersed in the ocean to the height of thirty-four feet, and were then perforated by the date shells. Later the land rose again, and the columns were once more upon dry land. Odd documents give proof that the temple formerly stood in the ocean, but that the land began to rise in the fifteenth century, for one of the old deeds of those times conveys to the priests of Puzzuoli "all the new land that is rising out of the water." The ground sank about fifty-two feet, rose again, and, according to all appearances, is now sinking. All these movements were so slow and gradual that not a stone has been displaced, and the columns stand as straight as they ever did. The question arises, By what means does the date shell accomplish its gigantic task? Some assumed that it secreted a strong and powerful dissolving liquid, the composition of which we do not know, but closer examination has revealed the fact that the boring is accomplished by means of fine silica needles on the feet of the animal, so that mechanical labor is required.

Fig. 8 represents a sponge—the antler sponge (*Raspailia viminalis*), in view of its peculiar shape.

Fig. 9 represents the well known sea cucumber, or *Cucumaria planei*.

A New Orang-Outang in London.

The somewhat formidable animal whose arrival at Mr. Jamrach's establishment was noticed in a recent impression of the London *Daily News*, from which paper we extract, has been safely housed at the Royal Aquarium, Westminster. In order to secure his comfort, and it may be added that of the public also, a strong cage has been fitted up, the bars of which are stout enough to allay any apprehensions as to the possibility of its restless occupant finding his way out. Writing on the subject of the orang-outang, Mr. Frank Buckland says that, "so far as can be judged he is an adult, or nearly an adult. He has been brought from Malacca in a box three feet high, and as he sits in the box the top of his head almost touches the top of the box." Stretched to his full height he measures about four feet, and seizes the bars at the top of his cage with the greatest ease, swinging to and fro with all the agility of his race. Some idea of his great strength may be gathered from the nervous energy with which he grasps the bar with his fingers, which are about five inches long, and from the muscular development of his arms and shoulders. He peels an orange with great dexterity, and sucks it with evident relish. He is fond of retirement, and when an opportunity offers will envelope himself from head to foot in his blanket, any attempt to remove which arouses a display of passion which would suggest a speedy retreat on the part of the offending person. His anger is expressed in a peculiar manner. He purses up his lips as though about to whistle a tune, and dashes about his cage with restless energy, stopping every now and then to peer through the bars in search of his enemy.

When in good humor his natural ugliness and the fierceness of his eyes are much softened by the intellectual formation of his forehead, which may be said to be beautiful by comparison with the other portions of his frame. This is a point in which naturalists will no doubt be interested. Although somewhat shy, he does not absolutely shun the public gaze, but generally looks straight before him over the heads of the crowd, as though searching for some object familiar to him. Any unusual sound, such as the beating of a drum, attracts his attention at once, and causes him to turn his head round sharply in a listening attitude.

Concluding his remarks upon this singular animal, Dr. Buckland states that "the hair about his head is so arranged that he appears to wear whiskers. He has, moreover, a red dish beard, and under his beard is a very remarkable pouch, the use of which has not as yet been clearly ascertained. As, however, it is capable of dilatation with air, it is, in all probability, directly connected with the organs of voice. It is a wonder to me how ever the natives managed to catch him, whether as an infant or full growth."

A NEW ACID PUMP.

The use of acids in the arts and manufactures is of great importance, and there is scarcely a laboratory or factory which does not use more or less acid, the quantity varying from a single carboy a month in the smaller establishments

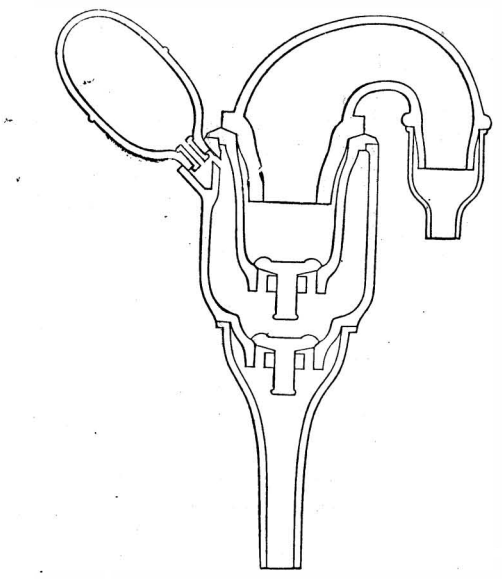

Fig. 1.—VERTICAL SECTION OF ACID PUMP.

to more than one hundred carboys a day in the larger works. The carboy, as is well known, consists of a large glass bottle holding from ten to twelve gallons, packed in hay, in a box with its neck protruding from three to six inches. A carboy of sulphuric acid weighs from 170 to 200 pounds, and is a heavy and cumbersome article to handle; and the problem of getting the acid out of this inconvenient holder without danger to life, clothing, and floors, has been the subject of much study and experiment. Various expedients have been resorted to for removing acid from these unwieldy packages, but they have been regarded as impracticable and unsatisfactory.

The late Francis Nichols, of New London, Conn., devoted his time for about eight years to study and experiment in this direction, and invented a pump which would pump the acid independent of the carboy without injury either to the pump or acid. His last inventions and improvements have recently been patented in this country and in Europe.

The principle on which the pump is constructed may be seen in Fig. 1. The body or working part of the pump consists of three glasses and a rubber bulb. The glasses are very carefully ground together and secured at the joints by screw couplings, making them perfectly air-tight. The two valves are fitted to their places and carefully ground by machinery constructed especially for the purpose. In use: the rubber bulb is compressed by the hand, which drives the air into the chamber between the glasses, C and B. The lower valve remains tight, and the air escapes through the valve near B. The hand, now removed from the bulb, allows it to expand, and as a vacuum is created in the chamber the upper valve closes and the acid rises through the section tube into the chamber to fill the vacuum. Another compression of the bulb drives the acid up through the upper valve, and the chamber is again filled with acid; as this operation is repeated the liquid flows from the nozzle of the pump. The relative capacity of the chamber and bulb is so nicely adjusted that the acid never rises high enough in this chamber to enter the bulb. It will be noticed that an air chamber is formed at every joint by a downward projection of the top piece; this prevents the acid from ever reaching any joint so long as the pump stands erect. A discharge tube attached to the nozzle of the pump extends to a point just below the bottom of the carboy, so that continuous pumping for a short time will give a siphonic action which can be instantly arrested at any time by the removal of the bulb from its nipple. A metallic bulb may be substituted for the rubber one, giving greater power. By means of a metallic bulb a large tube may be used on the siphon, which will be capable of emptying a carboy of sulphuric acid in less than three minutes.

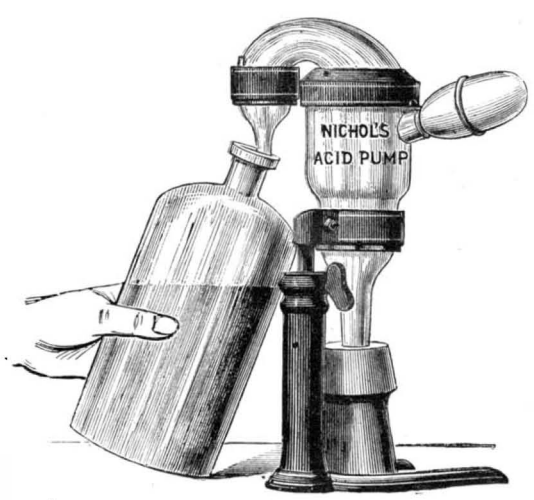

Fig. 2.—NICHOLS' ACID PUMP.

By the pump shown in Fig. 2, without the siphon, the quantity delivered can be nicely measured. Its action is rapid and perfect. The glasses are entirely enveloped in a light cast iron covering handsomely ornamented, and the apparatus is light, durable, and perfect in its action. Any quantity of acid can be drawn without the least danger to clothing, person, or floors, and the person using the pump, who may be entirely inexperienced in such matters.

These pumps have been examined and approved by the U. S. Mint, Assay Office, and Torpedo Station; the fire departments of New York, Boston, Lynn, Cambridge, Rochester; and over five hundred manufacturers of the United States. We understand that 1,200 of them are in use. They are now on exhibition at the Fair of the American Institute.

Further information may be obtained by addressing the Acid Pump and Siphon Company, New London, Conn.

The Fire Engineers.

The National Association of Fire Engineers convened in Boston, September 15. At its first session a report was submitted recommending organization on a plan based on the rules of the New York Fire Department. A report favoring the telegraph as the only reliable system for giving alarms was adopted. The second day Chief Hilliard, of Provincetown, in an essay on the firemen of the future, predicted the placing of the fire service on the same level with the army and navy as a means of public protection. The fact that pipes carrying low pressure steam will give rise to fires when in contact with wood, was held by Chief Hopkins to be fairly well established.

The protection of theaters and other places of public gatherings was considered in a report by Chief Engineer Green. He recommended the close and careful official supervision of such buildings during their construction. Theater stages, with their large area of inflammable properties, could and should be entirely separated from the auditorium by brick walls extending to the roof, with a gauze or iron drop. The latter should likewise be used to separate the stage and the auditorium, with ventilators over both, inclosed mainly in double-thick glass, which would answer for ventilation and would shut out cold air. The glass, in case of fire, would be broken by the heat, and the hole thus made would act as a chimney to let out the dense smoke and flame. Chief Nevins, of Brooklyn, favored the placing of such structures directly under the supervision of fire engineers with discretionary powers.

Charles S. Halloway, of Baltimore, made a report on the topic "Spontaneous Combustion," narrating a number of incidents illustrating the frequency of fires from this cause.

The drill of children in the public schools was next considered, Chief Combs, of Worcester, submitting a report in which he urged that more attention be given to this matter by school teachers. He advised the drilling of children, and thought that a drum should be kept in every school building, to be beat on only in case of fire, as a signal for the children to fall into line and march to the ordinary place of egress under the command of their teachers.

Other committees reported the advisability of the passage of State laws requiring buildings in business sections of cities to be fireproof and insuring better protection to people living in tenement houses.

In a valuable paper on the mutual relations of the fire engineer, the architect, and the underwriter, Mr. Edward Atkinson, of Boston, pointed out many common faults in the construction of buildings used for manufacturing and storage purposes. Chief among these are elevators, flues, and other air-connected spaces through which flames spread rapidly from floor to floor. The precautions against fire insisted on by the Boston Manufacturers' Mutual Fire Insurance Company have reduced the losses on mills, factories, and similar properties to one-tenth of one per cent on the amount of risks taken. A good word was said for petroleum, which is popularly supposed to increase the risk of fire. Mr. Atkinson said that the introduction of petroleum oils has been in many ways of benefit to the Mutual Insurance Company. About one-fourth of the factories insured therein are lighted with kerosene oil, but great care is taken to get the safe lamps and safe oil. Factories lighted with the vapors of gasoline are not insured at any rate. But the great value of oils made from petroleum in cotton factories is that they are "absolutely free from liability to spontaneous combustion," and one great source of danger has been removed by thir introduction."

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Mixing of White with Colored Light.

It was noticed several years ago that when white light was mixed by the method of rotating disks with light of an ultramarine (artificial) hue, the result was not what would naturally have been expected; for, instead of obtaining a lighter or paler tint of violet blue, the color inclined decidedly toward violet, passing, when much white was added, into a pale violet hue. Two attempts have been made to account for this curious fact: Brücke supposes that the light which we call white is really to a considerable extent red, and that the mixture of this reddish white light with the blue causes it to change to violet. Hubert, on the other hand, reaches the conclusion that violet is really only a lighter shade of ultramarine blue. He starts with the assumption that we obtain our idea of blue mixed with white from the sky, which, according to him, is of a greenish-blue color. We then apply, as he thinks, this idea to the case of a blue which is not greenish, namely, to ultramarine blue, and are surprised to find the result different.

Prof. O. N. Rood, of Columbia College, shows, in a paper in the *American Journal of Science and Arts*, that these explanations are hardly correct, since they fail to account for the changes which, according to his experiments, are produced in other colors by an admixture of white. Prof. Rood prepared a set of brilliantly colored circular disks which represented all the principal colors of the spectrum and also purple. These disks were then successively combined in various proportions with a white disk and the effects of rapid rotation noted, a smaller duplicate colored disk uncombined with white being used for comparison. It was thus found that the addition of white produced the following changes: Vermilion became somewhat purplish; orange became more red; yellow, more orange; greenish-yellow was unchanged; yellowish-green became more green; green became more blue-green; cyan blue became less greenish, more bluish; cobalt blue became more of a violet blue; ultramarine (artificial) became more violet; and purple became less red, more violet. Exactly these same effects can be produced by mixing violet with the foregoing colors.

These experiments, says Prof. Rood, seem to explain the singular circumstance that when complementary colors are produced by the aid of polarized light, it is difficult or impossible to obtain a red which is entirely free from a purplish hue, a quantity of white light being always necessarily mingled with the colored light. "In the case of the red, orange, yellow, ultramarine, and purple disks, I succeeded in measuring the amount of violet light which different proportions of the white disk virtually added to the mixture, and found that it is not directly proportional to the amount of white light added, but increased in a slower ratio, which at present has not been accurately determined. For the explanation of the above phenomena, Brücke's suggestion that white light contains a certain amount of unneutralized red light is evidently inapplicable, since the effects are such as would be produced by adding a quantity not of red, but of *violet* light, and for the present I am not disposed to assume that white light contains an excess of violet light. The explanation offered by Hubert does not undertake to account for the changes produced in colors other than ultramarine, and even in this case seems to me arbitrary. Neither have I succeeded in framing any explanation in accordance with the theory of Young and Helmholtz which seems plausible."

Method of Examination for Color Blindness.

The following is the order issued by the Surgeon General of the Navy for the examination of seamen for color blindness:

"Upon the receipt of this order and the colored worsteds to be used as tests, medical officers of ships and stations will make a careful examination of all persons in the navy as to their color sense, the result to be reported to this Bureau according to the accompanying form. Quarterly returns will also be made of the result of the examinations of those who shall be hereafter examined for the service.

"The method to be employed is that of Holmgren, and for this purpose a set of test wools is supplied, which contains three large skeins, 'test colors,' green, purple (pink), and red, and a number of small skeins, the 'confusion colors.'

"The usual mode of examination is by Holmgren's method, which may be briefly described as follows:

"The worsteds are placed in a pile in the center of a piece of white muslin which is spread out on a flat surface in a good daylight. The green test skein is placed aside upon the white cloth, and the person to be examined is directed to select the various shades of the same color from the pile, and place them by the side of the sample. The color blind will make mistakes in the selection of the shades; or a hesitating manner with a disposition to take the wrong shades may show a feeble chromatic sense. The purple test skein is then used. If the test with the green skein has shown the person examined to be color blind, and on the second or purple test he selects only the purple skeins, he is *incompletely* color blind; but if he places with the purple, shades of blue or violet, or both, he is completely *red blind*. If, however, he selects to be placed with the purple, shades of green or gray, he is completely *green blind*.

"The red test skein need not necessarily be used, but it may be employed to confirm the diagnosis already made, for the red blind will select to match the red skein, shades of green or brown which to the normal sense seem *darker* than the red, while the *green blind* will select the shades of green or brown which seem lighter."

The Slow Development of Sugar in Cane.

"Observer" contributes to the New Orleans *Times* the following observations made by him last year, showing the gradual development of sugar in cane:

August 12, wet weather, green joints, no sugar, lower joints polarized 4·8 per cent sugar.

August 19, dry weather, green joints, no sugar, lower joints polarized 8 per cent sugar.

August 21, wet weather, lower joints polarized 8 per cent sugar.

August 28, dry, cool nights, upper joints polarized 4·8 per cent sugar, lower joints polarized 9·6 per cent sugar.

September 10, wet weather, white cane, upper joints polarized 4·8 per cent sugar, white cane lower joints polarized 9·6 per cent sugar.

September 17, dry, bright, cool nights, purple cane, upper joints polarized 6 per cent sugar, lower joints 10·4 per cent sugar.

September 23, dry, sultry, warmer nights, upper joints polarized 8 per cent sugar, lower joints 13·6 per cent sugar.

September 30, dry weather, lower joints polarized 13·6 per cent sugar.

Early December cane of the following description was found, the ground being low and badly drained, and the cane very crooked at the same time: Density, 11·2 per cent (6·2° B.); polarized 8 per cent sugar, which is equal to 71·43 per cent sugar, and 28·57 per cent not sugar.

Juice like this would yield more than half molasses, from whatever percentage extracted out of 100 pounds of cane.

The juice of suckers had a density of 10 per cent (5 56 B.), and polarized 8 per cent, therefore poor in saccharine, but not inferior as to quality. Some planters seem to be made happy by suckers, but the foregoing analysis shows that there may easily be too much of a good thing.

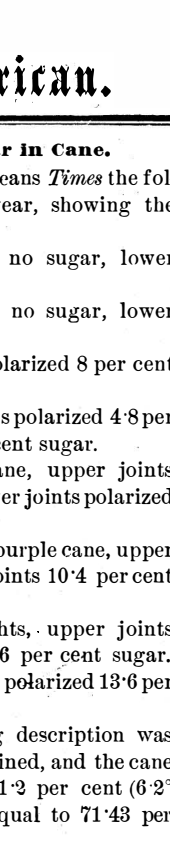
The lower part of good, sound cane showed juice of a density averaging 15 per cent with a polarization of 13·5. This would have been very good if three-eighths of the cane had not been as inferior as the above crooked cane.

From these observations, taken, however, as examples only, it can be seen that cane grown in well drained or easily drying lands, may be as good or even better the 1st of September than cane grown on low marshy soils by December.

STANDARD WIRE GAUGES.

BY M. W. GRISWOLD.

As all civilized nations divide the circle into 360 degrees, and as there can be no variation in any of these, nothing can be more standard than to take one of these angles for a wire gauge, an angle that everybody is familiar with and recognizes as fixed. But with this to begin with, no good would result if we were to select a certain size wire to start with, and then regulate all the other sizes from that (as in the old so-called standard gauges of the present day). This might perhaps do if all makers were to guess alike on their starting size. The metric wire gauge shown in the engraving starts at the center of the circle (or apex of the angle), which having no size is called 0, and to fix upon the points for the other numbers, the metric system is adopted as being a standard measure, and from 0 both sides of the angle are graduated so that one millimeter from the center gives No. 1; from No. 1 two millimeters for No. 2; from No. 2 three millimeters for No. 3; from No. 3 four millimeters for No. 4 (10 mm. from 0), and so on in arithmetical progression with one millimeter as the common difference.



With this gauge there is no guesswork in fixing upon a size, either to start with or to carry out the system indefinitely; and when referred, the exact diameter of any number can be easily calculated without measuring, if one prefers to do so, or does not happen to have a rule at hand.

The metric measure is adopted here, as it is evidently coming into quite general use, Spain having put it into full force throughout her entire possessions on July 15, and Turkey having gone so far as to recognize it.

If the wire consumers were to adopt this metric wire gauge and order from its numbers, the wire drawers would undoubtedly yield to the popular demand.

Mascart's Observations on Atmospheric Electricity.

The apparatus employed by M. Mascart for the measurement of atmospheric electricity is a Thomson's electrometer, in which the deviations of the magnetic needle are mechanically recorded by a pen.

The curves found by means of this apparatus, as described in a recent paper before the French Academy, proved that the potential electricity of the air is generally positive, especially when the sky is clear. On a cloudy day this electricity is diminished, changes rapidly, and is from time to time negative. Rain nearly always produces great deviations. An approaching storm is usually indicated by great negative variations, followed by very extended oscillations, a tendency toward negative electricity being predominant. Rains accompanied by positive electricity are extremely rare, and scarcely ever appear except during storms.

The intensity of the atmospheric electricity, which under ordinary circumstances is always positive, is by far greater and more uniform during the night than during the day. From 9 o'clock P.M. until 3 o'clock A.M., it varies but little: it decreases at sunrise, reaches its minimum against 3 o'clock P.M., rises again rapidly, and attains its maximum at about 9 o'clock P.M. The amplitude of the daily oscillation is much smaller during the winter than during the summer months.

A connection between the electric condition of the air and the temperature seems to exist, but several years may yet pass before this relation can be determined with certainty.

The fact that the maximum intensity occurs at night is contrary to the generally adopted law. According to the observations of Quetelet, in Brussels, two maxima of atmospheric electricity have been held to exist, one in the morning and one in the evening; and also two minima, one during the day, the other during the night. It is of the greatest importance that the observations of M. Mascart have corrected this erroneous assumption, which seems to be based upon imperfect observations.

The direct observation of atmospheric electricity has hitherto been made chiefly during the day hours, and the relative maxima found morning and evening have led to the erroneous assumption that a minimum of electric intensity occurred during the night.

Another very common source of error has also been overlooked, viz., the imperfect insulation of the apparatus. Care should always be taken that the glass supports of the apparatus are not exposed to the changes of the atmosphere. Many wrong observations have probably been caused by neglecting this precaution.

American Public Health Association.

The Executive Committee of the American Public Health Association have announced that the eighth annual meeting of the association will be held in New Orleans, December 7–10. Papers will be presented on abattoirs, epidemics, life insurance in its relation to the public health, the storm water question in city sewerage, the sanitary engineering problems of the Mississippi River, the hygiene of emigrant ships, the prevention of venereal diseases, voluntary sanitary associations, etc. The special questions suggested for discussion at this meeting, in addition to those connected with the papers above referred to, relate to methods of preventing the spread within a town or city—after they have once been introduced—of such contagious or spreading diseases as diphtheria, scarlet fever, yellow fever, measles, small pox, etc., and are as follows: What are the best means of securing prompt and reliable information as to the presence and location of cases of such diseases? What are the best means of securing isolation of the first or of single cases of such diseases, and what are the chief difficulties in securing such isolation? Under what circumstances is it proper to declare such diseases epidemic in a place? Under what circumstances is it proper to recommend the closure of schools on account of the prevalence of such diseases? What precautions should be taken at the termination of each case as to the care and disposal of the dead, the disinfection and cleaning of the room and house, and the period of time at which it is safe to allow the convalescent to return to school or society? Brief, practical papers upon any or all of these points are earnestly requested. Notice of intended papers should be sent to the president, Dr. J. S. Billings, Washington, D. C., or to Dr. E. H. Janes, Secretary, New York.

The Danish Butter Industry.

The Danes have made a marked advance in the butter industry by introducing the following measures:

1. Complete change of the butter season, which commences now on the 1st of November and ends on the 31st of August. In this manner the Scandinavian farmers produce the maximum of butter at the moment when the prices are the highest. While the butter of other countries pours into the London market during the spring and summer, the butter from the North occupies that place during the winter, a season when the scale is the most remunerative.

2. Introduction of Swarz's system into the dairies, *i. e.*, cooling the milk on ice, skimming after twelve hours, mathematical regulation of the churning, working and other manipulations, substitution of long and cylindrical vessels of polished sheet iron instead of little flat bowls of wood, and daily churning.

3. Fabrication of sweet butter, *i. e.*, butter churned immediately after the skimming.

The Racing Record Again Surpassed.

At Chicago, September 18, the celebrated trotter Maud S. surpassed the previously unparalleled record of St. Julien at Hartford (2:11¼) by half a second, making a mile in 2:10¾. On the same day, at Sheepshead Bay, Ferida beat by a quarter of a second the best time on record for a four mile race. The time was 7:23½. For twenty-five years the best time has been Lexington's, at New Orleans, 7:23¾.

Electricity from River Currents.

An inventor of this city proposes to utilize the swift current of rivers by systems of anchored floats carrying current wheels connected with electro-dynamo-machines. The electricity thus generated might be conveyed to factories on the shores and set to work by means of electro-motors; or it might be used for lighting towns, or even for running trains on railways.

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AN IMPORTANT SHOE MACHINE PATENT CASE.

A decree just made by Judge Samuel Blatchford, in the U. S. Circuit Court for the Southern District of New York, is of especial interest to all boot and shoe manufacturers. The case was that of the McKay Sewing Machine Association against the Scott Sole-Sewing Machine Company, and differs from a suit recently noticed in these columns relative to the same subject matter, in that there was now no question of a license or contract between the defendant company and the complainants. Considering the matter at issue in the latter trial only as involving the validity of earlier patents which the McKay Association own, and the question of the infringement of the same by the defendants, the Court has now ordered an injunction restraining the defendants from "making, using, or selling any boots or shoes" such as described in patent 29,562, issued in 1860, and since extended to August 14, 1881, or which "embody any of the improvements or inventions described and claimed therein, and from participating in or aiding in such manner and sale."

This case presents some peculiar features, aside from its being one of great importance, as involving the interests of large numbers of manufacturers engaged in one of our leading industries. Prior to the summer of 1858, nearly all sewed boots and shoes, except those with very thin uppers and light soles, called "turns," were made with a welt; that is, the inner sole had a light thread of leather cut therefrom in which the seam was laid, after which it was tacked to the last, the edges of the upper drawn over it, a narrow strip of leather, called the welt, sewed to both inner sole and upper, and to this welt the outer sole was sewed, all of the work being done from the outside. This, to-day, constitutes the way of making hand-sewed boots and shoes. In 1858 Lyman R. Blake patented a machine by which, from a horn or arm working inside the shoe, the stitches were taken directly through the innersole, the edge of the upper, and the outsole, without the insertion of any welt. This machine works very rapidly, immediately came into general use, and makes the greater proportion of what are now known as machine-made shoes. Within two years from making public his invention the inventor obtained subsequent patents, one covering the shoe itself as a new article of manufacture, and the other covering the process of making, both as independent of what had been secured to him by the patent on the machine. The defendants submitted evidence to show that boots and shoes had previously been made by hand by sewing through from outside to inside of the sole, but the Court considered that the way in which this was done, so far as set forth, made something of a different product, or was not so far practical as to impair the validity of the Blake patent for doing this work in the way it was performed by the machine.

It would be difficult to find, in the history of successful patented inventions, a line of improvements so energetically prosecuted, and with such widely diffused advantages to the general public, as have been those connected with the sole sewing machine. Previous to its introduction there was little but coarse work made in shoe factories, and the custom shoemaker and the cobbler furnished nearly all the boots and shoes of the better class worn. Now, however, it is probable that at last nine-tenths of all the boots and shoes produced in this country are of factory production. The sole sewing machine stimulated improvements in other departments of the business, but those who have had control of the patents therefor have always been fully alive to the demands of the trade upon them, as the numerous subsequent patents obtained by the McKay Association fully attest. Their business has, of course, been immensely profitable; they do not sell the machines, but lease them at a nominal sum, the manufacturers being obliged to put license stamps on each pair made. These stamps are for half cent a pair for children's shoes, one cent for misses' and youths', two cents for women's and 3 cents for men's, and, from one of the affidavits presented on the trial, it appears that the shoes made under the licenses issued up to the 16th of August last, amounted to the immense number of 441,490,380 pairs. Taking the average price of the stamps at 2 cents a pair, the total receipts of the Association from this source would, in round figures, be about $9,000,000, but even this large sum would form a very inadequate measure of the benefit which the public has derived from the introdution of these improvements. The pegging machine cheapened the price of coarse boots and shoes, but the sole-sewing machine, with its advantages for factory use, was necessary to bring down the cost of all the better grades of goods, and it efficiently accomplished this work.

The Life and Death of a World.

Mr. R. A. Proctor, the celebrated astronomer, recently delivered a lecture on the "Life and Death of a World," in the Town Hall, Adelaide, South Australia. The *English Mechanic*, from which paper we extract, remarks that Mr. Proctor, in his exordium, pointed out that perhaps the chief point in which the science of our own times differs from that of former days consists in the fact that, on a wider scale than the ancients did, we recognize the presence of natural law. Where the ancients traced the law of development in the history of a plant, or perhaps in the growth of forests, we in these days with a larger vision saw that the same law was in force all through the works of creation. Applying it to the world in which we live, we saw how continents had risen up from the ocean, and how the earth had been fashioned by a slow process of development that might require millions of years for its complete fulfillment. Extending its vision still farther the science of to-day recognized the same processes of development at work in the solar system—nay, throughout the universe; and it saw, too, that operating on this gigantic scale incalculable periods of time were necessary for the completion of those processes. It was his purpose that evening to bring before his audience, in such a way that they would be able to accept it, the evidence of the truth that the various orbs forming the solar system of which our earth is one member were all in, different stages of a world's life. To this end he began by dividing the history of a world such as ours into three distinct stages or epochs of development: the period of young life, the period of mid-life, and the period of old age. Each of the various members of the solar system, or indeed, the universe, was either now, or had once been, in the form of vapor at an intense degree of heat. Taking our own earth as an example, we could look back in imagination to that remote period when all the substances, liquid and solid, now forming the earth were in the shape of fiery vapors, and from the gigantic clouds they formed showers of molten metal, poured down as the planet gradually cooled; while in its intensely heated state the world would be expanded to a size immensely exceeding its present mass, and surrounded with thick, fiery clouds, holding all the present elements of our seas and continents in the form of vapor, but, as the world cooled down, the various metals, rocks, and other substances in the composition of the earth would gradually assume their present form. But still there would be such intense heat that one substance—water—would remain in the vaporous state, forming great belts of clouds, and, as the central nucleus of the growing planet continued to cool down, still further changes would take place. From the outside nothing would be visible but layers of clouds arranged in the order of rain clouds below, cumuli a little higher, and the light feathery clouds still further up. At last came the period of habitability, through which the earth is at present passing, and after that the period of decrepitude and decay, when from the intensity of cold no power of life could possibly exist. In order that we should properly appreciate the enormous length of time that all these stages of planetary development would require it was necessary that our conceptions of time should be enlarged like our conceptions of space, and just as we regarded space as infinite, and our little earth the merest point in the university of creation, so we needed to extend our ideas of time just as far in that direction. The geologist knew from what the rocks taught him that millions of years must have passed away simply during that period when the continents were being made and the rocks placed stratum by stratum as we found them in the present day; but the stages of a world's life before and after this one epoch in its history occupied incalculable periods of time. What time was required for these processes to be carried out could not be definitely settled. It was sufficient for his purpose to point out that it would probably be at least five hundred millions of years. The geologist told them that as the earth became old the waters would gradually diminish and the atmosphere would become too tenuous to breathe. Cavities would form, into which all the waters of the earth would be gradually soaked up; and at last, in the final stage of death, the atmosphere would disappear.

The lecturer then proceeded to show, by reference to the other planets of the solar system, how a criterion could be formed as to when a globe was in one or other of the stages of development he had indicated. The larger the planet was the greater time it would take in cooling down, and so when we came to Jupiter, whose diameter was seven times that of the earth, we should expect to find that every stage of its development would be seven times as long as the corresponding stage in the history of our earth. The larger planets must, then, be much younger than this world—or at least in an earlier stage of development—and the smaller planets very much older. Beginning with the sun, as the oldest body in our system, he pointed out that in development it was the youngest; and he showed that if five hundred millions of years had elapsed since the earth was a mass of glowing vapor, then three thousand five hundred millions of years would be required for the sun to reach the present stage of the earth. In the first stage the leading characteristic was intense heat, and every substance was in the form of vapor. So in the sun we found by the aid of the spectroscope that many of the substances in a solid and liquid state on the earth were there in a state of vapor. The next stage was represented by Jupiter and Saturn; the stage of mid-life by the earth and Venus; and the period of old age by Mars and Mercury. The last and final state—death—would be found exemplified in a still smaller body—the moon. Jupiter, one thousand two hundred and fifty times the size of the earth, and three hundred and forty times as massive, and Saturn, seven hundred times as large as the earth, and one hundred times as massive, represented the second stage of the earth's existence; and both in point of development were younger than the earth. If all the water on each were raised in the form of clouds our earth would appear greatly magnified in size to an inhabitant of Venus; and Jupiter presented exactly that appearance to us. One of the satellites of Jupiter had, on one occasion, been observed to pass inside the edge of the planet, and a few minutes afterward had been seen outside, as if it had suddenly stood still. If the visible surface of Jupiter was solid they would be required to believe that the crust of the planet had sunk three or four thousand miles—a change in its condition so momentous that the additional heat engendered would have arrested immediate attention. The real explanation was, according to the view he put before his audience, that all we saw of Jupiter was a vaporous substance raised above the planet itself, and the cloud masses enveloping it had passed away into the form of invisible vapor so as to leave the satellite within what had previously been the limit of the envelope. Through the edge of Jupiter a star could sometimes be seen, and probably the planet itself was thousands of miles below its apparent surface.

Referring next to Saturn, the lecturer pointed out that its condition corresponded with that of Jupiter; and he passed on to consider Mars, as an older planet, exemplifying the stage of decrepitude and decay. In that planet the area of the water surface had been reduced till it was only just equal to that of the land; and at the poles there were bright white caps which presented changes such as we should expect to see on the supposition that these caps were of snow. A chart of Mars, with its peculiar distribution of land and water, presented the appearance that the earth, according to calculations made on the basis of soundings taken by the Challenger, would have if half the water on its surface were absorbed.

Finally the lecturer dealt with the moon as illustrating the last stage of a planet's existence—that of death. That the moon had no atmosphere was shown by the extreme blackness of the lunar shadows. The atmosphere of the earth was illuminated, and its shadows were very different in appearance from those that were visible on the surface of the moon. The absence of water in our satellite was also clear; but the dark spots visible on its disk were shown to be low-lying levels where the water had been in the earlier stages of the moon's existence. The lecturer exhibited several magnificent diagrams depicting the utterly dreary aspect of the moon's surface, and he showed that millions of years hence, when the earth entered into the final stage of its history, it would present the same lifeless, arid appearance.

In conclusion, he remarked that the conception of the universe, as explained by him that evening, might appear to those who sympathized with the views of Brewster, Chalmers, and Dick, as to the existence of life in all the orbs around us, a conception at variance with our ideas of what was fitting.

On further consideration, he believed his audience would agree with him that the view he presented was not so cheerless as it appeared. If every orb in space was now inhabited the present stage must have been preceded by universal lifelessness, and would be followed by universal death; but if they accepted the view he had brought forward they would still be able to recognize that even now there are millions of worlds bearing life, like the planet of which we are the inhabitants. For space was infinite, and should there be only one life-bearing planet in every solar system, there would still be scope to conceive in the universe millions of worlds inhabited even at the present time. The number of stars visible through Lord Rosse's telescope could be no less than one hundred millions, but what instrument of human invention could fathom the infinity of the star depths? We were lost in the presence of the universe to which our reasoning had brought us. Laplace had said that the known was little, the unknown immense, but they might say with greater truth the known was nothing, the unknown infinity. As a fitting peroration for his lecture he recited the magnificent rhapsody of Jean Paul Richter, wherein the poet describes a man launched forth into space with an angel for his guide, and passing from constellation to constellation till his spirit aches with infinity, and the glory of God is insufferable. Then the angel raised his glorious hands to heaven and cried, "End is there none to the universe of God—Lo, also, is there no beginning!"

Utilizing Milkweed.

A writer in the Providence *Journal* predicts a useful future for the milkweed, which has heretofore been considered only a cumberer of the ground. Its seeds yield a finer oil than linseed; its gum can be used in place of India-rubber; and from its floss a fabric resembling Irish poplin has been made; while the young shoots are used in the spring by some people instead of asparagus, which they resemble in flavor. Now, pertinently adds the writer, if uses can be discovered for the thistle and whiteweed, they may prove friends in disguise.

An Exhibit on Wheels.

One of the features of Eastern fairs this fall is an exhibit car containing "Products of the Golden Northwest," furnished by the Northern Pacific Railway Company. In the collection are specimens of the agricultural productions of the country traversed by the road, stereoscopic views of scenery, native woods, and other objects likely to interest intending settlers. The car is run from fair to fair, and the exhibit is calculated to make a powerful impression.

A RETURN issued by the German Postmaster-General shows the number of post-cards used in Europe in the year 1878 to have been 342,000,000. Of that number 111,455,000 were posted in the United Kingdom, 108,741,000 in Germany, and 30,522,000 in France. In the United States during 1879, 246,000,000 cards were dispatched by the Post Office, and it is estimated that during 1880 the figure will rise to 300,000,000. The German postal authorities estimate the number of cards in use throughout the postal union at 700,000,000.

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$200,000 WORTH OF RIFLES.

The Largest Transaction in Sporting Arms on Record.

A NOTEWORTHY EVENT TO ALL SPORTSMEN. The Evans Rifle Co., manufacturers of the world-renowned twenty-six shot Evans Rifle (whose factory is at Mechanics Falls), has been complimented by both American and foreign manufacturers as the most extensive and complete in the world, have taken a signal, and in the face of the advance in firearms, a most commendable step. The Evans is the most expensively made, and has hitherto been the highest priced of all magazine or repeating rifles, embodying as it does a marvelously ingenious action, and carrying in its magazine (which is entirely within the stock, necessitating no outward addition) twice the number of *larger* cartridges than any other arm. The Evans is a phenomenal shooter, being accurate up to 1,200 yards, and every shot can be discharged in less than *one minute*. This arm has commanded the admiration of every sportsman in Europe and America who has used it, and it is as common in the best hunting grounds of Germany and France as in our own West, which would be a remarkable fact, prone as foreign sportsmen are to use home-made weapons, if it was not that the Evans is the only repeating arm in existence carrying enough cartridges in its magazine for a whole day's sport, and having that magazine entirely concealed within itself *and in the stock*, where the weight should be, not under the barrel, varying the "hang" of the arm with every shot. To return to the subject, the Evans Rifle Company have run their factory to its utmost capacity for the past two years, and have thereby accumulated an immense stock of rifles made at the lowest possible figure obtainable under the most favorable circumstances. The price of the Evans has hitherto been $40 and upward, and it was well worth it; but now the Evans Rifle Company propose, though it is in the face of a fierce opposition from the trade, to reduce the price of their arm to $18 and $20, thus placing the finest and most complete repeating rifle in the world on the par(pecuniarily)with a common single shot rifle. The only reason for this reduction is a desire to place with the reach of all the best repeating rifle in the market, and supplant many of the cheap, unsafe arms now in use. This is a step all the more commendable from the opposition it has met with from the trade, who wished the former high prices and big profits maintained; and the thanks of all sportsmen are due to a company actuated by these motives, especially at a time when the tendency in all branches of trade is to unnecessarily advance prices and profits.

The Evans Rifle Company have transferred their entire product to the warerooms of the well known Boston house of G. W. TURNER & ROSS, whose facilities for conducting this immense sale are unsurpassed, and through that firm will be offered over six thousand of the new and latest improved model Evans rifles at half former list prices, and the sportsmen of all countries will not be slow in taking advantage of the offer. We refer the reader to the advertisement and the testimonials of such well known shots as A. J. Boyd, Texas Jack, and others.—*Adv.*

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*

Chard's Extra Heavy Machinery Oil.
Chard's Anti-Corrosive Cylinder Oil.
Chard's Patent Lubricene and Gear Grease.
R. J. Chard, Sole Proprietor, 6 Burling Slip, New York.

Collection of Ornaments.—A book containing over 1,000 different designs, such as crests, coats of arms-vignettes, scrolls, corners, borders, etc., sent on receipt of $2. Palm & Fechteler, 403 Broadway, New York city.

Mr. Henry D. Hall (of the late firm of Hall & Benjamin) is now located with Messrs. J. & H. Berge. See their advertisement on page 236.

The Eureka Mowing Machine now is acknowledged as the best in the market. It has taken the first premium in nearly every State Fair this year. Prices to suit the times. Send for illustrated circular to Eureka Mower Company, Towanda, Pa.

For the Globe Street Lamp, address J. G. Miner, John St., Morrisania, New York City.

The Boomer & Boschert Press Co. have in daily operation, at the Am. Inst. Fair, a complete cider mill and cider jelly manufactory. New York Office, 15 Park Row.

50,000 Sawyers wanted to send their full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

H. W. Johns' Asbestos Liquid Paints are strictly pure linseed oil paints, and contain no water. They are the best and most economical paints in the world. Send for samples to the H. W. Johns Manufacturing Company, 87 Maiden Lane, New York, sole manufacturers of genuine asbestos materials.

Money wanted to secure Foreign Patents. Home patent allowed. Address Jeweler, Box 34, Whitakers, N. C.

Packing once tried always used. Phœnix Packing from 1-16 up in spools or on coils. Phœnix Packing Company, 108 Liberty St., N. Y.

Schenck's Planers and Matchers, Resawers, Scroll Saws, etc., etc. H. B. Schenck, Matteawan, N. Y.

Wanted, by a young Optician, a situation with a manufacturer of optical instruments. Chas. S. Minnich, Gratiot, O.

The great advantage of the genuine Asbestos Coverings for Steam Pipes, Boilers, etc., over any other forms of non-conducting coverings, aside from their superior effectiveness and fireproof qualities, is that they are manufactured in convenient form, ready for use, and can be easily applied without the aid of skilled labor. The H. W. Johns Manufacturing Company, 87 Maiden Lane, New York, are the sole manufacturers.

Electric Batteries, Wires, Bells, and Materials. Catalogue free. E. M. Wood & Co., Worcester, Mass.

Gas Machines.—Be sure that you never buy one until you have circulars from Terril's Underground Meter Gas Machine, 39 Dey St., New York.

Brick Presses for Fire & Red Brick, and Brickmaker's Tools. S. P. Miller & Son, 309 South Fifth St., Phila., Pa.

Eclipse Portable Engine. See illustrated adv., p. 189.

Small Brass and Iron Rivets made to order by Blake & Johnson, Waterbury, Conn.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

4 to 40 H. P. Steam Engines. See adv. p. 189.

Skinner & Wood, Erie, Pa., Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

Sweetland & Co., 126 Union St., New Haven, Conn., manufacture the Sweetland Combination Chuck.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 52 Dey St., N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Recipes and Information on all Industrial Processes. Park Benjamin's Expert Office, 50 Astor House, N. Y.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

National Institute of Steam and Mechanical Engineering, Bridgeport, Conn. Blast Furnace Construction and Management. The metallurgy of iron and steel. Practical Instruction in Steam Engineering, and a good situation when competent. Send for pamphlet.

For Yale Mills and Engines, see page 173.

Reed's Sectional Covering for steam surfaces; any one can apply it; can be removed and replaced without injury. J. A. Locke, Agt., 32 Cortlandt St., N. Y.

Burgess' Non-conductor for Heated Surfaces; easily applied, efficient, and inexpensive. Applicable to plain or curved surfaces, pipes, elbows, and valves. See p. 284.

Blake "Lion and Eagle" Imp'd Crusher. See p. 205.

Peck's Patent Drop Press. See adv., page 204.

C. J. Pitt & Co., Show Case Manufacturers, 226 Canal St., New York. Orders promptly attended to. Send for illustrated catalogue with prices.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 205.

Saw Mill Machinery. Stearns Mfg. Co. See p. 205.

Improved Solid Emery Wheels and Machinery, Automatic Knife Grinders, Portable Chuck Jaws. *Important*, that users should have prices of these first class goods. American Twist Drill Co., Meredithville, N. H.

Leather and Rubber Belting, Packing, and Hose Greene, Tweed & Co., 118 Chambers St., N. Y.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

The $4 Drill Chuck sent free on receipt of price. A. F. Cushman, Hartford, Conn.

Diamond Saws. J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 220.

For Wood-Working Machinery, see illus. adv. p. 221.

For Separators, Farm & Vertical Engines, see adv. p. 220.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 221.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

Blake's Belt Studs are best and cheapest fastening for all belts. Greene, Tweed & Co., N. Y.

For Patent Shapers and Planers, see ills. adv. p. 220.

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad. p. 141.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 221.

Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburg Steel Casting Company, Pittsburg, Pa.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 221.

Catechism of the Locomotive, 625 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

Elevators.—Stokes & Parrish, Phila., Pa. See p. 221.

Penfield (Pulley) Blocks, Lockport, N. Y. See ad. p. 221.

Wiley & Russell M'f'g Co. See adv., p. 190.

NEW BOOKS AND PUBLICATIONS.

INFORME QUE EL DIRECTOR DEL OBSERVATORIO METEOROLOGICO CENTRAL PRESENTA A LA SECRETARIA DE FOMENTO ACERCA DE LOS TRABAJOS VERIFICADOS EN AQUELLA OFICINA DURANTE LOS ANOS DE 1878 Y 1879. Mexico, 1880.

This is a beautifully printed pamphlet of 88 pages, giving a full report of the work accomplished by the Mexican Observatory during the years 1878 and 1879. From it we learn that the observatory does not confine itself strictly to astronomical work, but extends its operations to the investigation of the physical conformation of the country and to its natural productions. The relations of the climate to the health of the people; the distribution of plants and their time of flowering and perfecting their seeds; the influence of the atmosphere on the vital phenomena of plants; geographical explorations, etc., all come within the scope of this scientific institution's labors. This report is interesting as showing how much has been accomplished by the observatory during the comparatively short time that it has been in operation, as well as how great an advance in science our Mexican neighbors have made during recent years; and the account of the work herein given is the best proof that could be afforded of the importance and utility of an observatory like that which is so ably presided over by Professor Mariano Barcena.

REPORT ON THE GEOLOGY OF THE HENRY MOUNTAINS. By G. K. Gilbert. Washington: U. S. Government Printing Office.

The Henry Mountains are in Southern Utah, on the right bank of the Colorado of the West, and are a group of five mountains separated by low passes and arranged without discernible system. The highest rise about 5,000 feet above the surrounding plateau, their extreme altitude above the sea being somewhat over 11,000 feet. They were named after the late Professor Joseph Henry, and offer an exceptionally favorable field for the study of structural geology. As described by their explorer they mark a limited system of disturbances, which interrupt a region of geological column, and structurally as well as topographically stand by themselves. All the Henry Mountains exhibit dome like uplifts caused by a peculiar intrusion of porphyritic-trachyte between and under strata ranging from carboniferous to cretaceous. The igneous rock, instead of overflowing the surface and forming mountains in the usual way, stopped at a lower horizon and formed a vast cistern deep below the surface, lifting up the superior beds. The essential element of this type of mountain structure is called by M. Gilbert the laccolite, the study of which furnishes a novel and most suggestive chapter in structural geology.

REPORT ON THE LANDS OF THE ARID REGION OF THE UNITED STATES. By J. W. Powell. Second Edition. Washington: Government Printing Office.

The arid region of the United States comprises the larger part of the great Rocky Mountain region, where the mean annual rainfall is insufficient for agriculture. A small percentage of the area is irrigable, about a quarter is timber land, and the rest is divided between pasture lands and deserts. Professor Powell and his assistants treat of the physical characteristics and requirements of these different classes of land, as regards settlement and utilization, rainfall, water supply, the lands of Utah, land grants in aid of internal improvements, etc.

THE ENGINEER'S HANDY BOOK. By Stephen Roper. Philadelphia: E. Claxton & Co. pp. 678.

A well-made pocket book of practical information for mechanical engineers, particularly those of limited education, and such as may wish to qualify themselves for service in the U. S. Navy or the mercantile marine. The more important engines in use are clearly described and formulæ are given for estimating their power. Particular attention is paid to the Steam Engine Indicator, its use and advantages. The author has had much experience in this class of work, and writes clearly and plainly.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) J. H. G. writes: I built a skiff after the plans in No. 26, SCIENTIFIC AMERICAN SUPPLEMENT, and it is a good one. I built it strictly to the plans except the rowlocks. I took a piece of 2x4 hard pine, 26 inches long, and had a pair of thole pins made to go in; the pins were 5 inches long in the shaft part. I like it better than your plan. The boat proved to be a good one. It runs easy, and takes but little water and sets flat, so that with one in the stern and the oarsman, it does not stand up in the bow out of the water and look ridiculous. One thing about this boat, it will not tip or upset—safe in every way. Please give me a solution of the figures representing the tables in No. 39, for the sailing canoe? For instance, in table No. 1: rib, 8·5—rib A and 1, 15·62. I, being an amateur boat builder, do not understand these figures. A. These figures are the distances from the center line to the outside of frames on the several horizontal lines shown in first diagram. 2. Is there any process by which nickel plating can be done by friction, same as can be done by the amalgam of a looking glass? If so, where can the nickel powder be procured? A. Nickel cannot be applied in this way.

(2) B. R. writes: I am building a steam yacht which is forty-five feet long over all. I have her planked, and wish to know what would be best to calk her with, and if marine glue would answer the purpose of pitch for the seams, and which of the two would you advise me to use? A. We think marine glue would answer your purpose well. 2. What size boiler and engine would I require with a 40 inch screw? A. Engine 8 inch cylinder by 8 inch stroke; boiler 46 or 48 inches diameter by 6 feet high.

(3) C. H. H. asks: What degree Fah. would rightly express the temperature of an object which is four times as cold as ice, supposing ice to be just at 32° Fah.? A. According to popular usage, 96° Fah., or 96° below zero. The expression is, however, incorrect, since the word cold implies the absence of heat.

(4) R. M. writes: 1. I am going to build a hunting and fishing boat, about 4 feet wide by 14 feet long, decked over, and to weigh between 300 to 400 lb., and I want to know if I could use a screw propeller worked with gear wheels and operated by hand? A. Yes. 2. If so, how large should the propeller be, and how many revolutions should it make? I don't care so much for speed as I do for the convenience. A. 14 to 16 inches diameter. It should be geared to make 300 to 350 revolutions per minute.

(5) J. W. B. asks: Can engravings be transferred to mother of pearl? If so, how? A. Coat the shell with thin white copal varnish. As soon as the varnish becomes sticky place the engraving face downward on it and press it well into the varnish. After the varnish becomes thoroughly dry moisten the back of the engraving and remove the paper very carefully by rubbing. When the paper is all removed and the surface becomes dry, varnish lightly with copal.

(6) A. H. E. asks: By what process can beeswax be cleaned from comb and other substances which do not belong in it? A. Agitate it with about five times its weight of boiling soft water, cool, collect the wax, remelt and pass it through a fine linen strainer. It may be bleached by agitating it with hot water containing a small quantity of chloride of lime (wax 56, water 56, bleaching powder 7 lb.). When it has become white it is purified from the lime by the addition of a sufficient quantity of hot dilute sulphuric acid (acid 1, water 9), then repeatedly boiled with plenty of fresh water, collected, fused at a gentle heat, and kept in this condition until all adhering water has been driven off.

(7) G. A. L. asks if crude petroleum is what is used for fuel for steam boilers. Can I get what I want at the oil refineries, and is it more or less explosive than kerosene oil? Is there any danger of explosion from an open tank if kept cool? A. Generally crude petroleum is used for fuel; it is more explosive than kerosene used in lamps. There is great danger in having a light or fire near an open tank.

(8) F. E. K. writes: In the fall of 1877, while experimenting with the then comparatively new Bell telephone upon a metallic circuit, several hundred feet long, it occurred to me to pass the current through the body of a person. Cutting the line and placing the ends in the hands of my assistant, much to my surprise was able to talk with much distinctness. Other persons were added until four were included in the circuit, the volume diminishing with each addition. I then took the terminals of the line in my hands, and, with the telephones in a convenient position, actually transmitted my own voice through my own body, and distinctly heard the voice of the person at the other end of the line after it had passed through my own body. Physiologists can here find a wide and interesting field.

(9) F. S. asks: 1. Can I learn engineering from books alone, studying at home. If so, what books are required? Name some, please, for a new beginner. A. No; but you can with advantage study engineering books, while going through a practical education in a good workshop. "Bourne's Catechism of the Steam Engine," and "Roper's Catechism of Steam Engine" are suitable to begin with. 2. Is it necessary to serve an apprenticeship as machinist? If so, how long? A. Yes; the length of time depends upon the ability, attention, and energy of the apprentice.

(10) C. M. B. asks: 1. Which will draw the hardest, a wagon with a small axle or one with a large axle? A. Large. 2. Which will shoot the farthest, a rifle or a smooth bore, with the same powder? A. Rifle.

(11) J. P. P. asks: What will be the amount of water that would flow through half and three-quarter inch gas pipe, say two miles long, with from 400 to 600 feet fall to the mile? I wish to set my mill at the foot of mountain, and bring the water down for steam and for use about the houses, etc. A. Half inch pipe under 600 feet head, 3·4 cubic feet per minute; three-quarter inch pipe, under 600 feet head, 9·4 cubic feet per minute.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

A. J. L.—An impure fire clay. Might be useful for the manufacture of cheap pottery, drain pipes, tiles, etc. —J. C. H.—Chiefly clay—probably contains a small amount of lime phosphate.—A. S.—The powder consists chiefly of mica scales.—A. P. W.—Quartz with mica scales—probably contains traces of gold.

English Patents Issued to Americans.

From September 3 to September 7, 1880, inclusive.

Amalgamator, P. B. Wilson, Baltimore, Md.
Belting for machinery, G. S. Long, Hartford, Conn.
Cigarette machine, C. G. & W. H. Emery, N. Y. City.
Cigarette machine, E. Side, Brooklyn, N. Y.
Packing boxes, machinery for manufacture of, F. Myers, New York City.
Packing boxes, machinery for dressing the edges of, F. Myers, New York City.
Printing upon wooden cases, F. Myers, New York City.
Shutters, revolving, J. G. Wilson, New York City.
Valve, J. T. Hancock, Boston, Mass.

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INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

September 7, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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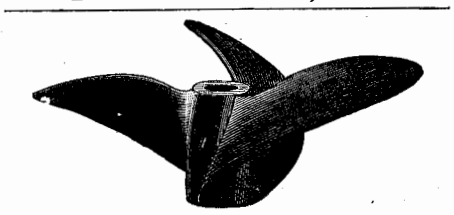

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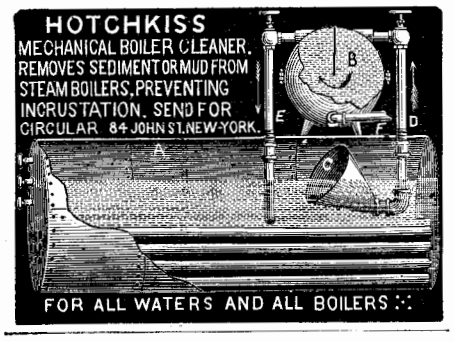
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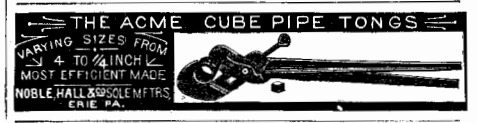

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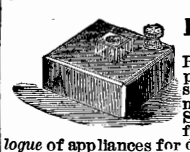

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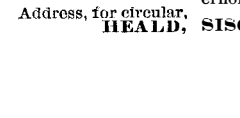

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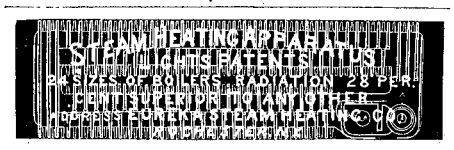

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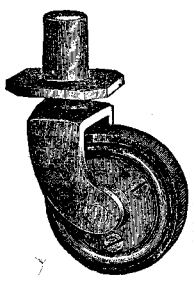

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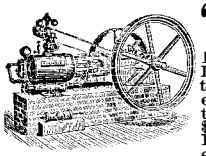

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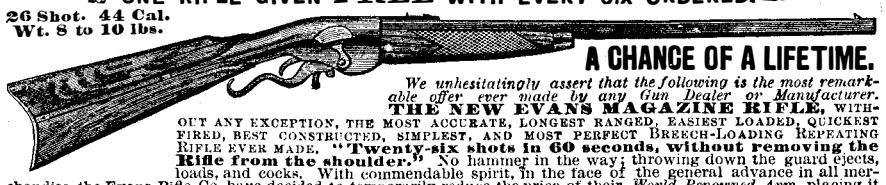

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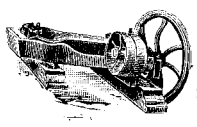

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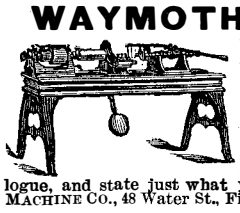

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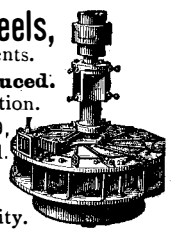

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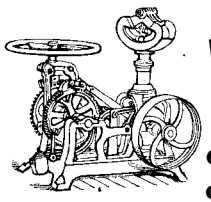

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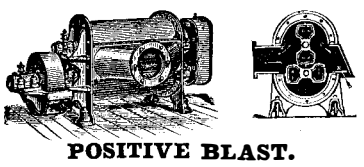

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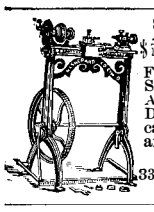

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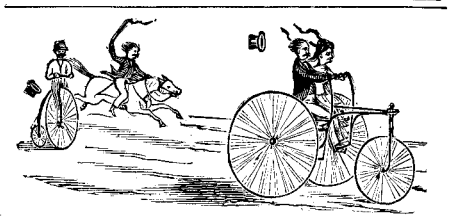

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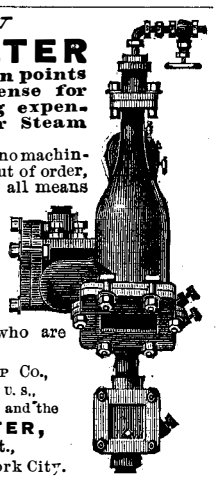

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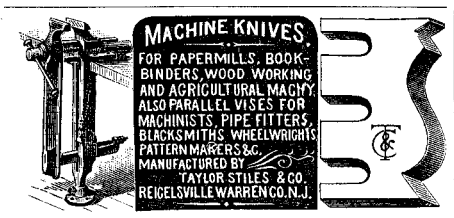
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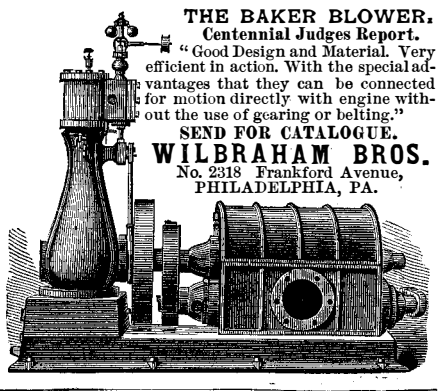

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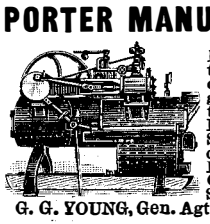

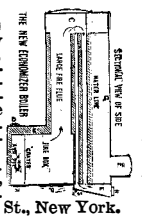

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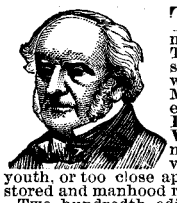

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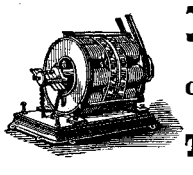

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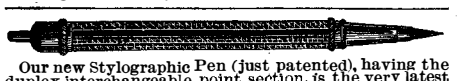

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